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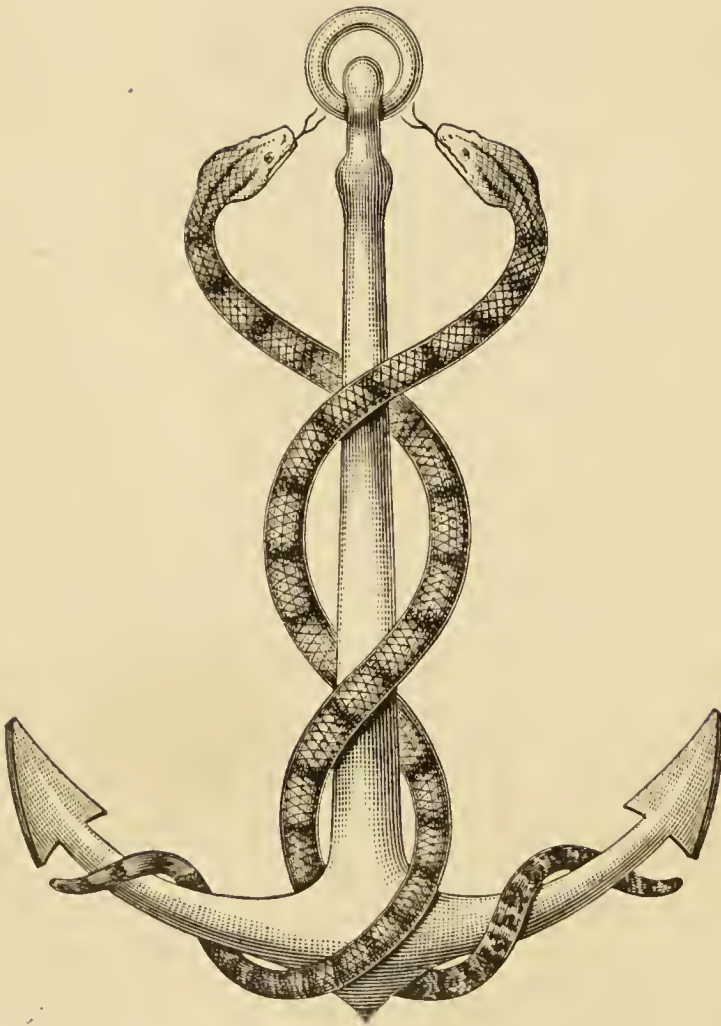
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FIRST AID TO THE INJURED  
AND  
MANAGEMENT OF THE SICK.



NUNQUAM ALIUD NATURA, ALIUD SAPIENTIA DICIT.



*THE BEARER'S COMPANION*

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FIRST AID TO THE INJURED  
AND  
MANAGEMENT OF THE SICK

*AN AMBULANCE HANDBOOK AND ELEMENTARY  
MANUAL OF NURSING FOR VOLUNTEER  
BEARERS AND OTHERS*

BY

E. J. LAWLESS, M.D., D.P.H.

SURGEON-MAJOR, 4TH V. B. EAST SURREY REGIMENT

ILLUSTRATED WITH FORTY-NINE ENGRAVINGS



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## PREFATORY NOTE.

THE Scientific Press having acquired the Copyright of Dr. Lawless' FIRST AID TO THE INJURED issues this republication of the work in the belief that it will be found most useful to all those engaged in Ambulance Work or in organising and training Volunteer Bearer Companies.

Neither the letterpress nor the illustrations have been interfered with in any way.

*August, 1898.*





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PART I.

FIRST AID TO THE INJURED.





# FIRST AID TO THE INJURED.

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## INTRODUCTORY.

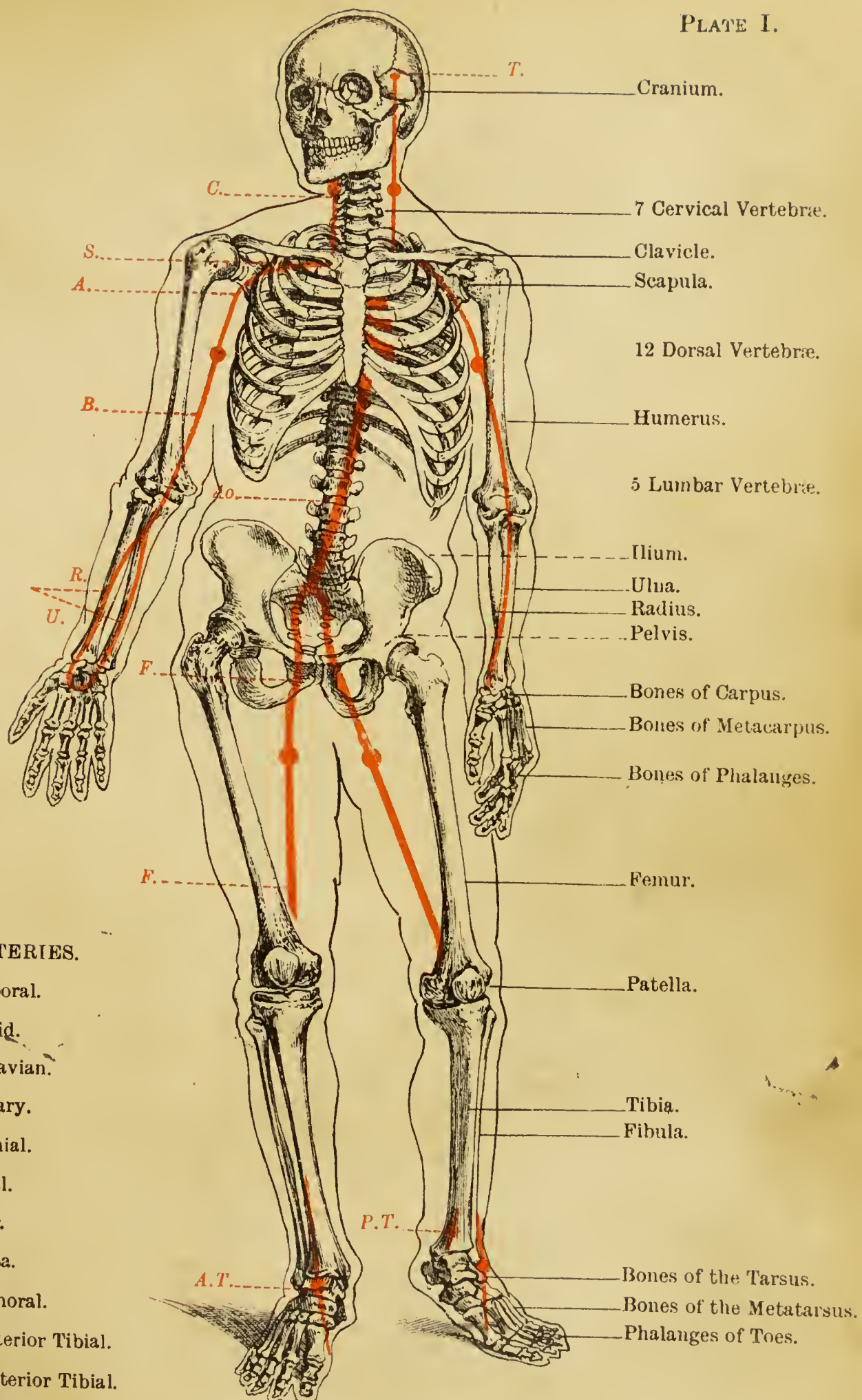
IT has been said,—and often well said,—that “a little knowledge is a dangerous thing,” and this will apply to no branch of study more than to that of ambulance work and first assistance to the wounded in the field.

It may be conceded, however, that a little knowledge if thoroughly mastered and sensibly applied is by no means so contemptible, and is sure at some time to prove of benefit to its possessor, and to others; this much at least we may claim for ambulance knowledge even of an elementary order.

In the course for the Army Ambulance Proficiency Certificate, it is the object of the instructor to train candidates to such an extent, that in the field they may be capable of removing the wounded, and may possess sufficient knowledge of such a kind as to give immediate assistance to the injured, by which suffering may be lessened, and death in many an instance averted.

The minimum course of twelve instructional lectures, which it is obligatory upon every instructor to deliver, should be attended throughout, if a candidate really desires to obtain an intelligent grasp of the subjects treated of; and

further, candidates should supplement their attendance at lecture by home study, to fix in their memories the points brought to their notice at the previous meeting of the class. An hour or two a week spent in this way will not be much of a tax upon the pupil's time, and will be amply repaid by the knowledge that in so doing he will ultimately lighten his own labours and those of the lecturer, and by the consciousness that if a thing is worth doing, it is also worth doing thoroughly.



# THE SKELETON.

The round spots show the sites for the Digital Compression of the Principal Arteries.





# LESSON I.

## THE SKELETON.

To be capable of giving useful assistance in cases of accident, some knowledge of the component parts of the human body is needful, and your attention is, in this first lesson, directed to the study of the bony framework of the body, or skeleton.

Examine a skeleton, or the diagram Plate I., and you will find that it consists of a backbone, made up of 24 distinct bones built one over the other to form the spinal column, supporting the skull at its summit, and resting below upon a base wedged between the two haunch bones, which are in their turn supported by the bones of the thighs, legs, and feet. From 12 of the bones of the spinal column spring 24 ribs, passing round 12 on each side, and joining a flat bone,—the breast-bone,—in the front, to form a cage, the cavity of the breast; upon the upper part of this cage behind, right and left, are two flattened bones triangular in outline, the shoulder-blades; and passing from the breast-bone right and left to meet the shoulder-blades are two curved bones, the collar-bones. At the junctions of collar-bones and shoulder-blades in the latter are cups or sockets from which depend the bones of the arm, forearm, and hands.

The skeleton in the adult is made up of 200 bones. Anatomists use Latin names for these, and some of them you must learn for the sake of brevity of description.

For convenience sake we divide the body into Head, Trunk, and Upper and Lower Extremities.

- |                         |   |   |                                    |
|-------------------------|---|---|------------------------------------|
| 1. The Head, made up of | { | the Skull or Cranium, and<br>the Face.  |                                    |
| 2. The Trunk, „ „       | { | the Spine or Vertebrae.<br>the Ribs and } or Costæ<br>Breast-bone } and Sternum.<br>Haunch bones or Ossa Innominata.<br>Sacrum, and Coccyx. |                                    |
| 3. Upper Extremity,     | { | Collar-bone   | or clavicle.                       |
|                         |   | Shoulder-blade  | „ scapula.                         |
|                         |   | Arm   | „ humerus.                         |
|                         |   | Forearm (2 bones)   | „ radius and ulna.                 |
|                         |   | Wrist (8 bones)   | „ carpus, and<br>hand and fingers. |
| 4. Lower Extremity,     | { | Thigh bone  | „ femur.                           |
|                         |   | Knee-cap  | „ patella.                         |
|                         |   | Leg (2 bones)   |                                    |
|                         |   | the large bone  | „ tibia.                           |
|                         |   | „ small bone  | „ fibula.                          |
|                         |   | Ankle (7 bones)   | „ tarsus, and<br>foot and toes.    |

**The Skull** or cranium forms a case for the protection of the brain, and is made up of,—the frontal bone, in front ; the occipital bone behind. The crown is formed by 2—parietal, right and left ; the sides by 2—temporal, right and left over the ears ; and inside, the sphenoid and ethmoid, forming the floor.

The occipital bone is perforated by a large circular hole ; each of the vertebrae or bones of the spinal column are hollowed out, forming rings ; when in position, one over the other, a hollow pillar is thus formed of great strength for the protection of the spinal cord or marrow, passing from the brain out of the skull through the hole in the occipital bone right down to the coccyx or terminal bone.

**The Face** is formed by 7 bones, viz. :—

- 2 nasal, forming the bridge of the nose ;
- 2 malar, forming the upper part of the face ;
- 2 superior maxilla, or upper jaw ; and
- 1 inferior maxilla, or lower jaw.

**The Spine** is made up of 24 hollow bones or vertebræ ; bony rings standing one on top of the other, with strong projections like spurs pointing directly backward and downward. The 24 vertebræ are divided into three sets :—

First, the upper 7 or cervical, supporting the head ;

Next, 12 dorsal, forming the back ;

Third, 5 lumbar, ,, ,, loins.

From the dorsal vertebræ spring the ribs, 12 on each side, curving round to the front of the frame, and jointed to the sternum or breast-bone. Of these 12 the upper 7 are called “true ribs,” because they are attached at either extremity to bone, *yiz.*, behind to the dorsal vertebræ, and in front to the sternum ; the lower 5 ribs are termed “false,” for though behind attached to vertebræ, in front they are not jointed to the sternum, but linked to one another (except the 11th and 12th ribs, which are free in front) by a semi-elastic substance called *cartilage*.

The sternum in front and the 12 dorsal vertebræ behind linked together by the 12 pairs of ribs, form the frame of the chest or *thorax*.

**The Pelvis**, supporting the spinal column, is formed of four bones, the

Right and left }  
and in front, } os innominatum or “nameless” bone ;

Behind, the sacrum ;

Terminated by the coccyx.

The right and left os innominatum (*ossa innominata*) or haunch bones are very large and irregular in shape, called “nameless” from the impossibility of comparing them to the shape of any known object ; they not only form the sides but the front of the pelvis, and are of particular strength below the portions forming the hips, where they furnish a bony cup or socket in which the knob-like head of the femur or thigh bone works. The sacrum is a strong bone of spade-like shape, jointing together the two nameless bones, thus completing the rim of the basin or **pelvis**, and



forming a base from which springs the spinal column. The sacrum is continued by a triangular tail-like bone curving forward, the coccyx. The pelvis is formed of bones of great width and strength (*a*) to afford a protecting case to some very delicate organs, such as the urinary bladder ; (*b*) to form a strong support for the spine, which in its turn has to carry all the structures above the waist ; and (*c*) to furnish sockets of great strength for the strong and heavy upper bones of the lower extremities, giving attachment to the powerful muscles working them and also to those of the trunk.

*The Limbs or Extremities — Upper Extremity.* — **The Clavicle** or collar bone is jointed in front to the side of the sternum, and passes outwards across the upper half of the front of the chest to the point of the shoulder, where it is jointed to a forward projection of the scapula or shoulder blade.

**The Scapula** is situated at the back and upper part of the chest ; it is triangular, and irregularly flattened ; base upwards, point downwards. It furnishes a strong socket in which the humerus or arm bone swings, and is strengthened and propped up by the junction with it of the clavicle.

The arm is divided for surgical purposes into arm, from shoulder to elbow ; and forearm, from elbow to wrist.

**The Humerus** is the only bone in the arm ; it has a ball head working in the socket of the scapula, and an expanded lower end gouged out as it were for the heads of two other bones to hinge in, the bones of the forearm.

**The Radius and Ulna** are the bones of the forearm attached to the lower end of the humerus to form the elbow-joint, and at their lower ends to form the wrist-joint. In certain positions of the forearm, the radius and ulna are almost parallel ; the radius is on the thumb or outer side, and the ulna on the little finger side, when the palms are turned to the front.

**The Carpus** or wrist is formed of 8 small irregular bones

strongly bound together. Springing from the carpus are the bones of the hand or ~~metatarsus~~<sup>carpus</sup>, 5 in number, and from the hand the *phalanges* or finger bones, 14 ; two bones to the thumb and three to each finger.

*The Lower Extremities.*—In their number of bones and arrangement these are almost identical with the upper extremities. We find the femur, a long shaft with a ball head working in a socket, like the humerus ; the leg, like the forearm, formed of two parallel long bones, jointed to the shaft above them forming the knee-joint, and below to the ankle, an arrangement of bones like the wrist and numbering only one less ; and from the ankle bones forming the foot and toes, in number identical, and in placing and form almost identical with the bones of the hand and wrist.

**The Femur** or thigh bone is a long, strong shaft of bone with, at its upper end, a neck projecting diagonally upwards from it, and capped with a ball-like top to work in the socket of the pelvis : below, the shaft expands to form the knee-joint, with the *patella* or knee-cap in front, and the *tibia* or shin bone below.

**The Tibia and Fibula** form the leg ; the tibia, thick and strong, forming the shin ; and the fibula, a long, delicate, rib-like bone running parallel with the tibia on its outer side, and jointed to it both above and below. Below, the leg bones join the **tarsus** or ankle bones, from which spring forward the bones of the foot (*metatarsus*) and toes (*phalanges*).

## LESSON II.

BONES—STRUCTURE AND ARRANGEMENT OF—PERIOSTEUM  
AND CALLUS—FRACTURES—VARIETIES—DETECTION—  
GENERAL TREATMENT OF.

IF the surface of any bone be examined it will be found furnished with hollows, grooves, ridges, bosses, or perforations, either of these singly or in combination. The eminences or the reverse serve for the attachment of the tendons of muscles, and for the insertion of strong binding materials called ligaments and cartilage.

On making a section it will be noticed that the bone substance is not of uniform appearance and consistence, but composed of two varieties, an outer portion of dense ivory-like hardness, called the *compact* tissue; and an inner, in appearance net-like, or like fine sponge, called the *cancellous* tissue; and if a longitudinal section is being looked at of such a bone as the femur, tibia, or other long bone, notice that it is hollowed out nearly from end to end, forming a cylinder, this cylinder contains the marrow.

Where the ends of bones play over one another, as for instance in the case of the lower end of the femur and upper end of the tibia in the knee, they are furnished with a substance called cartilage, which is elastic, and acts like an indiarubber packing, preventing jars between the ends of the bones.

Bone in life is composed of two classes of materials, an animal or gelatinous, and an earthy. The earthy portion is largely made up of salts of lime, remaining after death in the



form of the bones you are familiar with. Each bone in the body is covered with an enveloping membrane called the **periosteum**, and is perforated by apertures through which blood vessels enter its interior for its nourishment.

**The Periosteum** scarcely ever escapes being torn or irritated when a bone is broken or fractured, and in such a case what takes place is briefly this:—If the bones are kept at rest, and the soft parts around are not inflamed, about the sixth day after the fracture the materials for the repair of the broken bone are deposited between and around its broken ends. It is the periosteum which is the chief agent in this act of repair, for from it oozes out some fluid matter containing the earthy or lime constituents of bone, which are deposited, in homely language, as a cement or glue between the broken ends. The deposit thus formed is called “callus,” and when firm union has taken place any of the *callus* not made use of is taken up or re-absorbed into the system.

**A Fracture** means the breakage of a bone, so that any interruption of the surface or wound of a bone is a *fracture*, such as the cracking, splitting, or bending, these are all just as much *fractures* as when the bones are broken right across; known as *complete* fractures. In the following lessons, however, where “fracture” is used, it is to be understood as *complete fracture*.

Fractures are of three chief varieties, viz. :—

1. Simple; 2. Compound; 3. Multiple.

**Simple** where the bone is broken across once, without apparent injury to the soft parts around.

**Compound** where, in addition to the broken bone, we find a wound of the flesh and skin leading from the outside of the body down to the ends of the broken bones.

**Multiple** where the bone is broken across more than once.

The last two varieties may occur combined, where

not only is there a wound leading to the seat of fracture, but also a double or triple breakage of the bone itself, known as a *compound multiple fracture*.

All fractures are serious accidents, but compound fractures are more than doubly so. Unless the very greatest care is taken when handling a broken limb a simple fracture may quickly be converted into a compound. Now, a simple fracture, under favourable conditions, heals in from four to eight weeks; but a compound fracture means that the sufferer may not leave his bed for six months, or may never leave it at all except for conveyance to the cemetery.

*Detection of Fractures.*—What are usually called the signs of a fracture are briefly:—Inability, alteration in appearance, extra mobility, *crepitus*—a grating or grinding noise if the two broken ends are rubbed against each other; shortening of limb, and an unevenness at some spot along the surface, which the finger may detect if passed along the bone.

The most reliable of the above signs in the hands of all but a surgeon is the first, **inability**. If a man's humerus or femur be broken he cannot use it below the seat of fracture, *there is inability*. **Pain** is another very reliable sign, there is seldom a fracture caused by direct violence in which there is not pain, and in which the patient will not complain of pain if you catch hold of the limb.

*General Treatment of Fractures.*—That a broken bone may unite properly the following conditions are essential:—

- A. That the broken ends be brought opposite to each other in the line occupied by the bone before fracture;
- B. That when thus brought into line they are to be there immovably kept by means of outside supports;
- C. And that the limb in which the broken bone is, shall have perfect rest subsequently for the whole time necessary for the fracture to unite.

Having ascertained that a fracture does exist, or strongly



suspecting one, if the patient need not be at once removed, and can lie comfortably where he is till a surgeon comes, let him remain ; only adopting such measures as will prevent any worse injury, which means that the broken limb is to be restored to its natural position, and kept so by outside support.

As an instance, suppose a man has fallen on a flagstone pavement ; when you go to his assistance you find he cannot rise because one limb is helpless, there is *inability*, he cannot bend up his knee, and perhaps the foot rolls over in a helpless manner to the outer side ; get hold somewhere of some rugs, blankets, pillows, sacking, or straw, anything that will roll up like a bolster, place one roll right along the injured side from the hip to the foot, gently turning the foot and leg from its sidewise position upwards, so as to point the foot naturally forwards ; place another roll between the legs, and thus support the limb and keep it from rolling about, or hold it so.

It is only in a few instances, however, that this “let alone” policy is admissible, the object of your training is that you shall be taught enough to do much more in those numerous cases where no surgical aid is at hand.

To carry out “condition *A*” it is almost always necessary to practice extension of the limb. The muscles inserted into the bone above and below the seat of fracture having lost their fixed base of insertion are now contracted somewhat, and in contracting have pulled the upper fragment of the bone one way and the lower fragment another, causing the broken ends to be displaced out of line or producing over-riding or deformity.

To prevent the rough or sharp ends of the bones from lacerating the soft parts around, extension is first practised before putting on supports. To extend, the upper portion of the limb must be steadily grasped by another pair of hands encircling it, and held firmly—*counter-extension* ; whilst with your own hands you gently, slowly, and steadily

grasp the limb *below* the fracture and pull on it, *i.e.*, practice *extension*. This extension must be free from all jerking or twisting movement, and must be kept up not more than a couple of minutes, by which time the contracted muscles will have become relaxed and the broken ends resume their original line (Fig. 1).

“Condition *B*” can now be fulfilled. Supports of some kind must be affixed to the limb, and these supports are known as splints. In first aid assistance anything stiff and long enough for the purpose may be improvised into

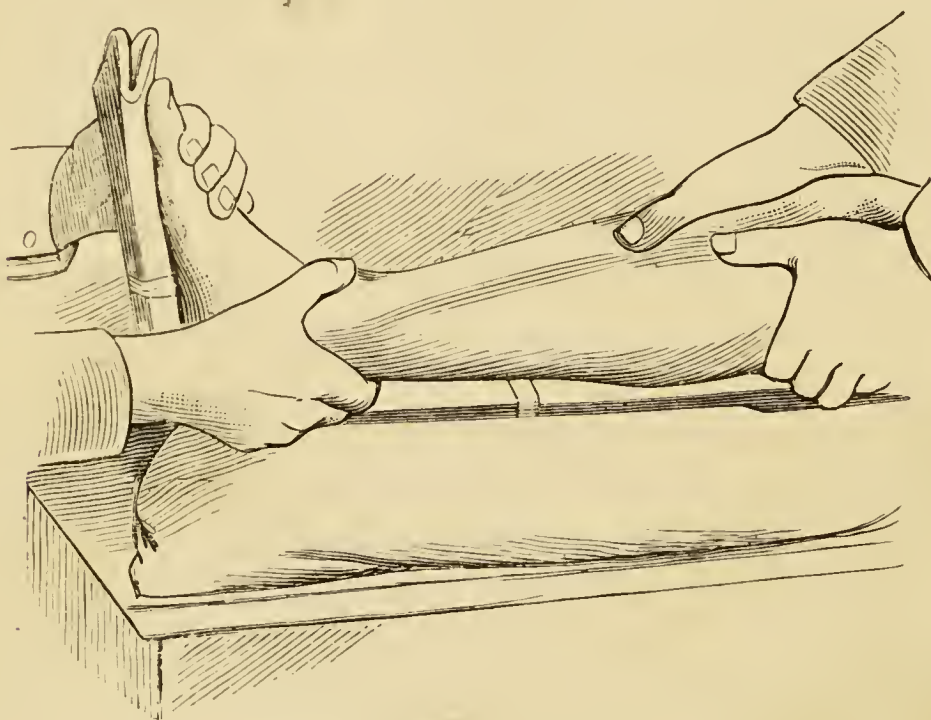


FIG. 1.—Extension and counter-extension.

splints; in a subsequent lesson splints will be specially noticed, here I need only say that in applying any support it should be placed parallel to the injured bone, and additional security is given if double supports can be applied, one along the outside of the injured limb, and a second along its inside; and further, and this point is of great importance—the supports applied should be long enough to *include the joint above the fracture*; thus, in the case of a fractured tibia, the supports should, if possible, reach from a few inches above the knee right down to the sole of the foot; or, in

fracture of a femur, from the sole right up into the armpit. Suitable supports to the splints must finally be applied, *i.e.*, bandages.

“Condition *C*” is only fulfilled after the patient has been transported to the place where he is to remain during treatment.

Clothing is not to be removed in first aid to fractures, boots, leggings and trousers are to be left alone, and the supports placed outside them. There is an exception to this rule, as indeed to most, but that will be noticed in treating of wounds in compound fractures.

Finally, in the general rules for treating fractures, remember that no case is to be lifted off the ground to be placed on a stretcher, cart, or in a cab or litter, unless first some support, as a splint, has been bound on; even where nothing can be found to turn into a splint there is the patient's sound thigh or leg, bind the fractured one to this rather than to nothing before lifting him.

## LESSON III.

### THE TISSUES—MUSCLES—NERVOUS SYSTEM—INTERNAL ORGANS—AND THE CIRCULATION OF THE BLOOD.

THE soft parts covering in the bony framework of the body are known generally as the tissues, and are skin, fat, and muscle, together with their blood vessels and nerves.

The red masses of flesh seen in well-stocked butchers' shops are familiar examples of the tissue called **muscle**. Muscle, when closely looked at, is found to be arranged in bundles of fibres, and these possess the peculiar property of shortening or contracting themselves under certain conditions. When stimulated by various influences, such as a pinch, a sudden blow, heat, electricity, or another form of electricity, *nerve stimulus*, muscles contract, the consequence being that they compel whatever is attached to their ends to get into motion. Thus, in the case of the large muscle on the front of the arm, well known to you all as the biceps, one end of it arises from a part of the scapula forming the point of the shoulder, passes lengthwise down over the humerus, to which it is partly bound down, and terminates, or is *inserted*, into another bone, the radius. When the biceps shortens, or contracts, therefore, in the act of contracting it will draw up the forearm towards the arm.

All the various movements of the body are caused by the contraction of different muscles, or sets of muscles. There are two varieties of muscles—those under the control of the will, these are called *voluntary*; and the second set the *involuntary*, which act or contract independently of our con-



trol. A good example of the action of an involuntary muscle is one which we have all, at some time, personally experienced, namely, the emptying of the stomach in vomiting.

In addition to the property they have of producing motion and locomotion, muscles play the important part of being the stay-ropes, or supports, of the skeleton. This is maintained in the perpendicular by the contraction of various sets of muscles acting from opposite sides, and balancing the frame, as it were, between them. Thus, the muscles at the back of the tibia, inserted into the foot, contract and prevent the legs from falling forward, and the body with them ; at the same time, to keep the legs straight, some immense muscles on the other side, on the front of the femur, contract, and so keep the body from falling backward. The trunk, spine, and head are all maintained after a like manner by the contraction of opposing sets of muscles.

I have mentioned *the will* in connection with the muscular acts, and this brings us to consider very briefly the agents by which, and the central agency from which, the will is communicated to the muscles, namely, the *Nerves* and *Nervous System*.

**The Brain, the Spinal Cord, and the Nerves** are together spoken of as the Nervous System. Popularly, the nerves may be compared to telegraph wires, conveying impulses or messages from the central stations of the brain and spinal cord to the various localities, the muscles and organs of the body, to which they are distributed.

*The brain* is contained in the cavity of the skull, and is the seat of all the higher qualities of man. Here are seated thought, the will, the higher senses of sight, smell, taste, hearing, &c., the regulation of complex muscular movements.

*The spinal cord* receives impulses or commands from the different centres of the brain, transmitting these to the



various organs, and muscles, and parts of the skin, through the medium of the nerves.

With, as it is supposed, the single exception of the nails, there is no portion of the body, however minute, that is not supplied with nerves; and when this nervous supply is interrupted or cut off from a part, that portion of the frame becomes powerless, and is said to be *paralysed*.

The spinal cord, as already mentioned (page 6), passes from the brain, through the occipital bone, and through each bone or vertebra of the spinal column. The large nerve branches, or spinal nerves, pass into the body, through apertures formed by grooves on the vertebræ, dividing and subdividing into hundreds of smaller nerves.

There is yet another system of nerves which, when acted upon at the surface of the body, conveys a knowledge of the fact, or impulse, to the cord and brain. When the skin is wounded, for example, this occurs, the impulse producing a condition of the nervous system known to us as *pain*; and if the wound or surface affected is very extensive, as in the case of a burn or scald, in which a large number of surface nerves would be involved, the impulse carried up to the cord and brain as *pain* may be so overwhelming as to produce that excessive disturbance of the nerve centres which is known as *shock*.

The bones of the trunk are so paired and arranged as, when jointed together, to form cavities for the protection of delicate internal parts or organs.

The ribs, sternum, and spine, forming the cavity of the chest, or **thorax**, are for the reception of the heart, aorta, large blood vessels, nerves, and lungs.

The thorax is closed below by a strong muscular apron, the diaphragm, which, with the lower vertebræ, lower ribs, bones of the pelvis, and muscles and tendons attached thereto, form another and larger cavity, that of the **abdomen**.

In the abdomen are the stomach, liver, bowels, kidneys,

urinary bladder, spleen, pancreas, and lower aorta, and large veins, nerves, and arteries.

**The Circulation of the Blood** is carried on by the heart, the arteries, the capillaries, and the veins,—three distinct sets of blood vessels.

To understand the mechanism of the circulation whilst reading this description, study the diagrammatic chart in Plate II.

**The Heart** is divided from above downwards into two unequal halves; these again by a cross partition, by this arrangement making four compartments in the heart.

Of these four compartments the two upper are the **Auricles**, the two lower the **Ventricles**.

Each auricle communicates with the ventricle of its own side beneath it, but there is no cross communication from auricle to auricle, or ventricle to ventricle.

Each auricle has apertures on its outer side for the entry of large veins; each ventricle has also a large opening in the side from which a large artery arises.

The heart is a hollow muscular pump which, at each contraction, propels the blood it contains first into the arteries. The arteries themselves are also pumps of minor degree, and they next pump the blood into very minute vessels, the **Capillaries**. Through the capillaries the blood filters slowly till it reaches some larger vessels, the **Veins**. By the veins it is gathered up from the capillaries of the remotest parts of the body, and conveyed in a highly impure state into the heart again, but to the side of the heart opposite to that from which it started. It is now, a second time, pumped away from the heart up into the lungs, where, by the act of respiration, it receives oxygen during its passage through them for its nutriment, at the same time parting with its impurities, in the shape of carbonic acid gas and moisture, exhaled at every breath.

Consulting Plate II., by the arrows you can trace the circulation of the blood, starting from **L.V.**, or left ventricle,—

pumped by the **L.V.** first into the Aorta or **Ao.**, the largest blood vessel and artery in the body. One portion of the **Ao.** ascends in the chest, and branches off into arteries which supply the head and upper body and extremities.

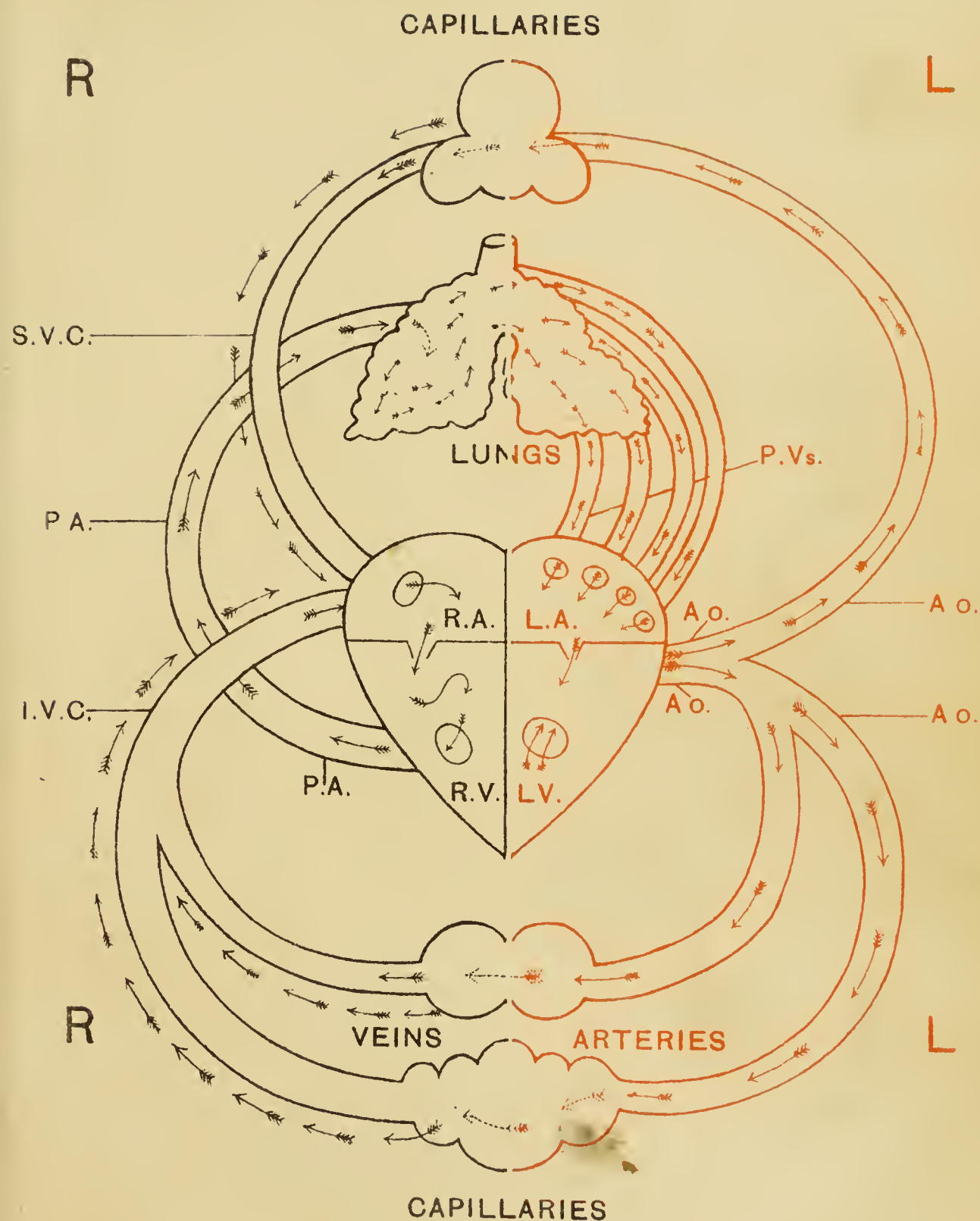
The other portion descends in the abdomen till about opposite the navel, dividing and subdividing like the stem and branches of a tree to the most distant parts of the body, down to the little toes themselves. Following the arrows through the capillaries (three sets), notice that they pass on showing the blood streams collecting and being carried to the heart again on its right side,—by the large vein (**S.V.C.**), superior vena cava, from the upper body, and by the (**I.V.C.**), inferior vena cava, from the lower body. Arrived now at the right auricle (**R.A.**), trace the arrow through this into the right ventricle (**R.V.**), thence into the (**P.A.**), the pulmonary or lung artery, thence through the lungs into the (**P.V.'s.**) pulmonary veins leaving the lungs, into the left side of the heart again, entering there the left auricle (**L.A.**), thence again into the **L.V.**, and so, on and on, till death, for ever describing a double circle or figure of eight.

The blood brought to the **R.A.** by the **V.C.'s.**, passed through the **R.V.** by the **P.A.**, is dark coloured, being highly charged with carbonic acid and other impurities. On exposure to the oxygen of the air in the lungs, it loses its dark purple tint, and becomes a brilliant red, as soon as it takes up the oxygen. As a red stream, therefore, the **P.V.'s.** bring it to the **L.A.**, and the **L.V.** pumps it that colour into the **Ao.**, where, and in all the other arteries (except the pulmonary artery, which always contains dark, impure blood), it remains a bright red colour till reaching the capillaries, where it begins to darken.

This colouring of the blood is of importance, as in bleeding from a wound it helps us to judge whether the bleeding is from an artery or a vein.

If an artery be pressed with the finger, it will communicate to it a throbbing or *pulsation*. At the wrist, just over the





THE CIRCULATION OF THE BLOOD.

The capitals 'R' and 'L' indicate 'right side' and 'left side' respectively—the right half of the heart being on the left of the page, the left half on the right of it





radius, an artery can readily be thus felt, and this spot, for convenience sake, is chosen for counting the beats of the heart, or counting the pulse. Arteries are elastic tubes, and are enabled to contract, being furnished with a coat of muscle tissue, and, by the help of this muscular envelopment, are enabled to continue the impetus given to the blood by the heart when the stream is pumped out by it. This contractile throbbing is of importance, as will be seen when we come to consider the subject of bleeding from wounds.

In the capillaries the blood moves slowly, and, through their walls, gives up its nourishing contents to the various tissues of the body, and absorbs or takes up impure waste materials from them in the form of carbonic acid, these impurities causing the blood to assume the dark, purplish colour found in the veins.

All the veins carry impure blood to the heart except the **P.V.'s.**, which, conveying straight from the lungs the blood just fed by the oxygen of the air, contain bright red blood; hence the great necessity for breathing fresh air.

The blood in the arteries is always being carried *from* the heart in a red, pure state, except in the **P.A.**, which passes the accumulated impure blood from the veins to the lungs.

## LESSON IV.

THE LUNGS—AERATION OF THE BLOOD—THE EXCRETORY ORGANS, THE SKIN AND KIDNEYS—RESPIRATION.

**The Thorax**, or chest, bounded by the sternum, the dorsal vertebræ, and the ribs, and diaphragm, contains the organs of breathing, the right and left lungs; between and to the front of them, the heart, with the roots and terminations of the large blood vessels connected with it, some large nerves, and portions of the windpipe or *trachea*, and gullet or *œsophagus*, descending behind the heart.

The heart is enclosed in a double bag of membrane, the *pericardium*, separating it entirely from contact with the lungs, and each lung is also enclosed in a double membranous bag, the *pleura*. Intense pain is the result of inflammation of either the pericardium or pleura; the layers of the pleura are enabled to glide over each other and against the chest walls when the body is in health by a iubricating fluid which oozes from them; when this free movement between these layers is checked, as by inflammation, the condition is known as pleurisy, frequently the result of exposure to cold or wet.

The heart is in size about as large as the closed hand and fingers of its owner, and is placed behind the lower two-thirds of the sternum obliquely, with its apex pointing downward to within an inch of, and about in line with, the left nipple. Here the hand placed on the chest will readily detect its beats.

Into the minute physiology of the lungs I cannot here

enter, but will endeavour in as few words as possible to give you a description of their structure.

At the lowest part of the throat in front you can handle the windpipe, or trachea: after entering the thorax, this divides into two branches (bronchi), right and left, one to each lung; comparing the trachea to an inverted tree, the progress of the bronchi is similar to the tree's branches; each bronchus or branch again dividing and subdividing, and spreading out twigs which reach in all directions in and over the lung substance. The comparison to the tree may still further be used, for, as at the end of the twigs and minor branches of a tree are found leaves, which botanists tell us are really air cells supplying nourishment to the tree, so at the ends of the air tubes are very minute clusters of delicately thin bladders or bags, **the air cells**. In contact immediately with these air cells are the capillaries of the lung tissue. (The capillaries, you will remember, are very minute blood vessels between the arteries and the veins, through which the blood has to pass from the left half of the heart all over the body to the right half.) It has been stated that the impurity in the blood is due to the presence in it of a gas—**carbonic acid** gas: for the blood to become pure and bright red in colour, this carbonic acid gas has to be thrown off by it in some way, and **oxygen**, another gas, must be substituted. In the air of the atmosphere, provided it is tolerably pure, there are in 100 parts nearly 21 of oxygen, and only .04 of carbonic acid, less than half a part; so that in the act of breathing pure air, this comparatively large proportion of oxygen enters the windpipe, passes down the bronchi and smallest air tubes, and fills the *air cells* at the ends of them. The lung capillaries, charged with dark venous blood highly impure with carbonic acid, are in close contact with the air cell walls. We have now then this condition—a delicately thin moist cell wall immediately in contact with the equally delicate capillary wall, on the one side is carbonic acid gas, on the other oxygen;

the former passes through and escapes into the air in the act of expiration or *breathing out*, whilst at the same time, in inspiration, oxygen is drawn into and inflates the air cells, and passes into the lung capillaries, oxygenating, or purifying, the blood.

In addition to purifying the blood by giving the carbonic acid an opportunity to escape, the lungs get rid of another waste product of the body, viz., water, in the form of vapour—expired air is always moist, as you are aware. The lungs form one of a set of three great body cleansers, spoken of as the excretory organs, the other two being the **skin** and the **kidneys**. The excretory organs are all engaged in getting rid of or *excreting* the waste products of the body, and these waste products are (*a*) carbonic acid, (*b*) water, and (*c*) urea. The skin gets rid of some carbonic acid, a little urea, and very much water in the form of perspiration. The kidneys get rid of some carbonic acid, urea, and a very large amount of water. These three excretory organs then are all engaged in the same duties, the lungs directly purifying the blood, and the other two also, but indirectly.

The floor of the chest cavity is formed by the **diaphragm**, a strong, muscular, apron-like partition dividing the thorax from the abdomen, attached all round by its border to the ribs, dorsal vertebræ, and sternum—thus taking a more or less dome shape in roofing in the cavity of the abdomen. In addition to this muscle, the interspaces between each of the ribs are stretched across by muscles called *intercostal*, so that the thorax is practically lined with muscles.

**Respiration**, or breathing, is a compound act, consisting (*a*) of inspiration, or breathing in air ; and (*b*) of expiration, or breathing it out.

The organs and parts of the body concerned in this vital function are—the lungs and their appendages (trachea and bronchial tubes, &c.); the heart and pulmonary vessels, and the blood they carry ; the diaphragm ; and the outer and inner intercostal muscles.



When the diaphragm muscle acts and contracts it descends, enlarging thus the cavity of the thorax ; the outer intercostals also contract, raising the ribs and assisting the lungs to descend after the diaphragm—these movements being much assisted by the natural elasticity the lungs themselves possess. The result of these combined movements being the drawing-in of air, or inflation of the lungs—that is, inspiration.

The converse of this act, viz., the rising of the diaphragm again to its dome-like shape, pressing against and pushing up the lungs—the *inner* intercostals now coming into play and compressing the lungs at the same time by *depressing* the ribs—force the lung tissue to contract and expel the air, thus emptying (nearly) the lungs of air—that is, expiration, or breathing out.

The number of *respirations* in a minute, in ordinary breathing, are from 17 to 20, varying, of course, with the amount of exertion the body is undergoing at the time. It is necessary to bear the average number of respirations per minute in mind, when performing artificial respiration, to restore breathing.



## LESSON V.

THE COURSE OF THE PRINCIPAL ARTERIES—STRUCTURE OF VEINS AND ARTERIES—BLEEDING OR HÆMORRHAGE—THE THREE VARIETIES OF — ARREST OF — BY THE FINGERS, BY TOURNIQUET.

IN order to be capable of rendering assistance in checking one of the gravest dangers which can happen to the body, that of bleeding, or hæmorrhage, from wounds, it is essential that those who are to act as bearers should possess an accurate knowledge of the size, position, and course of the principal blood vessels, but especially of the arteries, for a few seconds delay in applying prompt and correct measures for checking hæmorrhage in wounds may mean death—*i.e.*, death from loss of blood.

Of the arteries (Plate I.), the **Aorta** is the largest, in the thorax arching up from the heart, and then descending through the diaphragm into the abdomen, as far as a point behind the navel, there dividing right and left.

In the thorax it cannot be reached, of course, by the hands; but on deep pressure with the fingers in the centre line below the navel, when the abdominal walls are relaxed by bending up the thighs, it can distinctly be felt throbbing.

These first branches of the abdominal aorta are called the right and left iliac arteries. Each again divide, sending one branch on each side to the back of the pelvis, and one each to its front; those to the front are called external iliacs.

The external iliac artery (right or left) passes over the

front brim of the pelvis at the groin, coursing down the thigh, where it takes its name from the large bone beneath it, the femur, and becoming the

**Femoral Artery.**—No amount of description in print will give an accurate idea of the course of the arteries. It is only by actual demonstration on the part of the instructor, by marking out the course on a thigh or arm, that these can be learnt. The following surface markings, however, must be studied and thoroughly mastered :—

In the erect posture, upon self-examination, if the fingers of the hand are passed in a line above the prominence felt under the skin of the hip bone, up to the edge of the pelvis, they will encounter another bony prominence, the front and **Upper Iliac Spine.**

The junction of the two haunch bones, above the genital organs, is called the **Symphysis Pubis.**

Draw a line between these two points, and from the centre of this line draw a second obliquely downwards and inwards to the inner side of the expanded end, or condyle, of the femur at the knee.

This second line downwards covers the course of the femoral artery. Winding round into the back of the knee-joint, and passing down almost perpendicularly, it is here called the—

**Popliteal Artery**, from the space it traverses, the popliteal space, or ham. A little below the ham it divides into two branches, taking their name from the tibia, and called anterior and posterior tibial.

**The Anterior Tibial Artery** passes forward to the front of the leg between the tibia and fibula, coursing along the outer side of the tibia over the instep and down a little way along the space between the great and fourth toes. Along the lower part of the tibia in thin people it may sometimes be felt but not often ; along the instep it can usually be readily detected pulsating. It is here called the **Dorsal Artery of the Foot.**

The other branch, passing downwards behind, is the **Posterior Tibial**, sinking deeply into the muscles of the calf and passing down in the centre of the hollow space just behind the inner ankle, where it may be felt pulsating, into the sole of the foot, running forwards to supply the toes.

We must now return to the upper part or arch of the **Aorta**.

No artery from this, passing up to supply the upper extremities or head and neck, can be reached with the hands till we come to the clavicles. Lying beneath the clavicles are the first ribs, and crossing them in an outward direction are the **Subclavian Arteries** coursing towards the armpit.

**The Subclavian Artery** can be felt pulsating strongly if the finger or thumb be passed over the clavicle at its centre and pressed directly downwards and backwards, at the same time pressing down the shoulder with the free hand to bring the artery upwards nearer to the finger compressing.

**The Carotid Arteries** pass up the sides of the throat on each side of the windpipe under an imaginary line drawn from the junction of the clavicle and sternum to the angle of the lower jaw bone, beneath and in front of the ear. Pressing with the tips of the fingers deeply down on either side of the windpipe, the carotid can be felt throbbing. At the angles of the lower jaw bones the carotid divides into two branches, an inner and an outer. The outer, called the **External Carotid**, runs up the jaw just in front of the ear to that bony prominence which can there be felt on the face; here it divides into two, one part supplying the region above and behind the ear, the other the temple, here called the **Temporal Artery**.

Upon reaching the armpit the subclavian becomes the **Axillary Artery**, and if the arm be raised well away from the side, it can be felt beating as it crosses out of the axilla over the head of the humerus.

**The Brachial Artery** continues the axillary and passes



downwards and forwards to the front of the joint in the hollow of the elbow. It is easily found and pressed against the humerus ; by gripping the swelling muscle or biceps on the inner front of the arm and pressing downwards the tips of the fingers it can be readily felt pulsating. It divides at the elbow into the **Radial** and **Ulnar** arteries—the radial coursing down along the radius to the wrist joint, and the ulnar down the ulna. At the wrist the radial or the pulse can be felt by everyone ; with some practice the ulnar artery may also be felt pulsating at the lower end of the ulna. The radial passes between the metacarpal bones of the forefinger and thumb, entering the hand deeply and forming a circular arterial channel called the **Deep Palmar Arch**.

The ulnar artery enters the palm over the front of the wrist, forming the **Superficial Palmar Arch**.

Accompanying the arteries are large veins, taking their names in almost all cases from the arteries themselves, except in the neck where the large veins are called the jugulars, and superior and inferior vena cava accompanying the aorta. Although the word accompany is here used, it is only to be applied as meaning *situation*, not direction ; for remember the blood stream in the femoral vein is going in just the opposite direction to the blood in the femoral artery, for example.

Both arteries and veins are compressible ; the former possess a muscular as well as an elastic coat, and when an artery is torn across, the elastic portion of the tube at the severed edges draws itself in or retreats, Nature thus endeavouring to render the loss of blood less by making the opening smaller.

The peculiarity in the construction of the veins is that they are furnished with valves which permit the blood stream to flow only one way, towards the heart. Arteries have no valves, except those at the orifice, where the pulmonary artery and aorta commence, to prevent the reflux of blood into the ventricles of the heart.

**Bleeding or Hæmorrhage.**—When there is a wound of the soft parts of the body, and even in a fracture of bone, there is a tearing or lesion of one or more of the three varieties of blood vessels—of the arteries, capillaries, or veins.

When the wound is of the capillaries, there is a general oozing of blood from the minute orifices of the tiny vessels ; this variety of hæmorrhage usually stops after a little while naturally by the blood clotting on the surface and sealing up the mouths of the capillaries.

The blood escaping from a wounded vein is of a dark purple colour (not *blue* as it is usually painted in coloured diagrams), but becomes brighter, more like that from the capillaries, on exposure to the air. It escapes in a slow trickling, described sometimes as in a “welling” manner, from some part of the wound, and is more difficult to check than in capillary hæmorrhage.

Arterial bleeding is always most serious from the furious manner in which the severed artery throws out the blood in jets at each contraction, and is the most difficult to check of all three varieties. The blood jerked out is of a brilliant red hue, and the form it assumes if spurted over something white, such as linen, paper, or the skin, leaves no doubt upon the mind as to its source. It is something like dipping a pen very full of ink and flicking its contents, by the aid of the forefinger of the other hand, across a sheet of white paper, the arrangement of the line of blots thus made is similar to the staining by blood jerking forth from a severed artery.

It has been written that “there is no bleeding from the exterior of the body which cannot be temporarily arrested by firm pressure with the fingers.” This is very nearly true, only the pressure must be accurately directed and firmly applied.

In capillary hæmorrhage very little pressure is sufficient to check the bleeding. A small fold of lint maintained with a bandage usually does so in a few seconds. In the case of a



vein, it is first very necessary to remind one's self of the direction in which the blood stream is flowing, for pressure directed on the course of a vein between the wound and the heart will *not* check the hæmorrhage. The pressure has been applied on the wrong side of the wound (it must be applied on the side of the wound distant from the heart), and it is comforting to be able to tell you that bleeding from most veins may usually be stopped by (*a*) removing any article of dress obstructing the free flow of blood up to the heart above the wound; (*b*) elevating the limb; and (*c*) by applying a pad of lint, or some such material, to effect pressure upon the wound itself by means of a bandage.

**Arterial Hæmorrhage.**—In this form, if sufficient pressure can be applied on the line of artery severed between the wound and the heart from whence the blood stream is proceeding, the bleeding can be stayed.

Fortunately for wounds with arterial bleeding, the large arterial trunks run, as a rule, in close proximity to a bone, against which it is possible to compress them with the fingers. This is the method of arresting hæmorrhage known as digital compression.

Digital compression may be made either in the wound itself by pressing on the bleeding-point with the finger or thumb, and so closing the hole in the artery, or, as frequently has to be done, on the line of the main arterial trunk supplying the limb some distance above the wound.

Digital compression is only a temporary means of arresting bleeding. It cannot be practised for long, not only because of the pain caused by the process to the subject of the wound, but also because of the cramping of the compressor's fingers. Instead of with the fingers, the main artery may be compressed by an apparatus, called a tourniquet, consisting in all its forms of a pad placed over the artery tightened round the limb by means of a strap, and exerting pressure in that way.

The surgical treatment of arterial bleeding I may mention

here, as you will find it interesting. The edges of the wound are lifted up, blood clots which obstruct the view are turned out, and the end of the spouting artery seized either with a pointed hook, called a tenaculum, or with a pair of artery forceps. A thread of silk is then passed round below the instrument and tied in a double reef-knot tightly. This is the treatment *by ligature*.

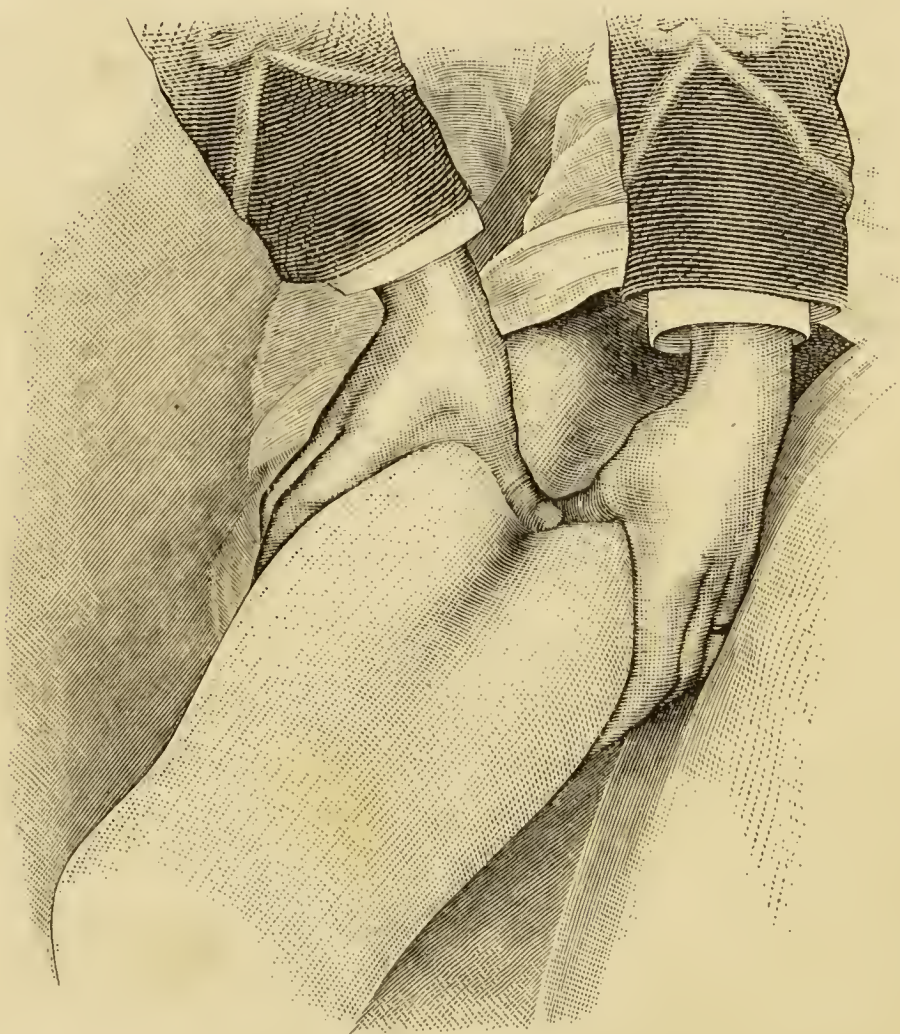


FIG. 2.—Digital compression of the femoral artery.

As an aid to memory, I here arrange in the form of a table the arteries compressible by digital compression, and the bones against which each may be compressed, also the courses of the arterial trunks. Those arteries which may be compressed at the same spot by the pad of a tourniquet are indicated by a capital T preceding their names.

FOR ARREST OF BLEEDING FROM WOUNDS OF THE  
LOWER EXTREMITY.

<i>Artery.</i>	<i>Bone.</i>	<i>Course.</i>	<i>Spot to apply Pressure.</i>
(a) Femoral.	Brim of Pelvis.  Shaft of Femur.	Down the thigh from the pelvis to the knee from a point midway between iliac spine and symphysis pubis to inner side of end of femur at knee-joint.	Against brim of pelvis, midway between iliac spine and symphysis pubis.
T. (b) Femoral, <i>see Fig. 2.</i>			High up on the inner side of the thigh, about 3 inches below brim of pelvis, over the line given in direction of the knee.
Posterior Tibial.	Inner side of tibia, low down above ankle.	Downwards to foot in hollow just behind the prominence of inner ankle.	(For wounds in the sole of the foot),— against the tibia in centre of the hollow behind the inner ankle.



## FOR WOUNDS OF THE FACE.

<i>Artery.</i>	<i>Bone.</i>	<i>Course.</i>	<i>Spot to apply Pressure.</i>
Temporal.	Temporal bone.	Upwards of $\frac{1}{2}$ in. in front of ear.	Against bony prominence immediately in front of upper part of the ear or on temple.
Facial.	Lower part of lower maxilla.	Across the jaw diagonally upwards from below.	An inch in front of angle of lower jaw on the face.
Carotid.	Cervical Vertebrae.	From outer upper edge of sternum to angle of jaw.	Deeply down and backwards an inch to the side of the prominence on the windpipe.



FIG. 3.—Digital compression of the subclavian artery.



## FOR WOUNDS OF THE UPPER EXTREMITY.

<i>Artery.</i>	<i>Bone.</i>	<i>Course.</i>	<i>Spot to apply Pressure.</i>
Subclavian, <i>see Fig. 3.</i>	First rib behind clavicle.	Across middle of first rib to armpit.	Deeply down and backwards over centre of clavicle against first rib —(depress the shoulder first).
Axillary.	Head of humerus.	Descends across outer side of armpit to inside of humerus.	High up in armpit against upper part of humerus.
T. Brachial, <i>see Fig. 4.</i>	Shaft of humerus.	Along inner side of humerus under edge of biceps muscle.	Against shaft of humerus by pulling aside and gripping biceps pressing deep down tips of fingers against the bone.

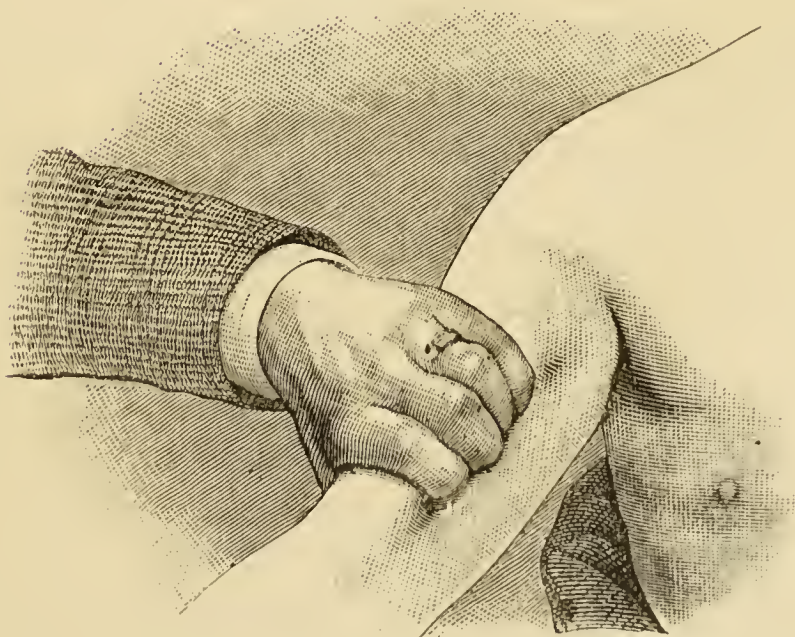


FIG. 4.—Digital compression of the brachial artery.

This digital compression requires practice, and you should never feel satisfied until you can distinctly feel each

of the arteries mentioned throbbing under the fingers when applied.

**The Graduated Compress** in wounds where the arterial bleeding is not excessive may be employed to check hæmorrhage. On the bleeding point in the wound is to be pressed a small pad of lint, tightly folded to about the size of the point of the finger ; this is slipped under the thumb and tightly pressed over the bleeding aperture. A second pad a little broader is made and placed over the first, then a third, fourth, or fifth, one over each other, each successive pad being a little larger than the one preceding it. In this way a cone-shaped inverted pad or graduated compress is formed, the apex of which presses on the bleeding spot, and the base of which rises above the surface level of the wound outside. A larger pad should now be placed over the compress and a bandage tightly bound on over all.

**Tourniquets** are of various forms, all of which resolve themselves into a pad to place on the line of the artery, and a strap which, when drawn tight, encircles the limb, pressing down the pad. The disadvantage of the ordinary tourniquet is that in addition to compressing the artery, its strap encircles the limb so tightly that the return circulation in the veins is obstructed, the parallel unwounded arteries supplying the limb also ; thus not only is the supply of blood cut off from the wound, which is what is desired, but the whole circulation supplying the limb, both of arterial as well as venous blood is entirely cut off, a matter by no means to be desired, as the limb becomes strangulated, and unless the tourniquet is removed in time, mortification or death of the part will set in from entire absence of blood supply.

You will no doubt be able to see and handle a field winged screw tourniquet, or that known as Moffitt's.

Surgeon-Major Moffitt improved the design of the original screw tourniquet (Petits) by attaching two brass arms or wings to it above the pad ; and by means of these

wings, the return or venous circulation through the limb remains free, the strap being kept away from the sides of the limb by the wings, pressure is made only between two opposite points, by the pad over, and the part of the strap under the limb. Moffitt's tourniquet (Fig. 5) is applied by (1) *unscrewing* the screw till the plates are brought together ;

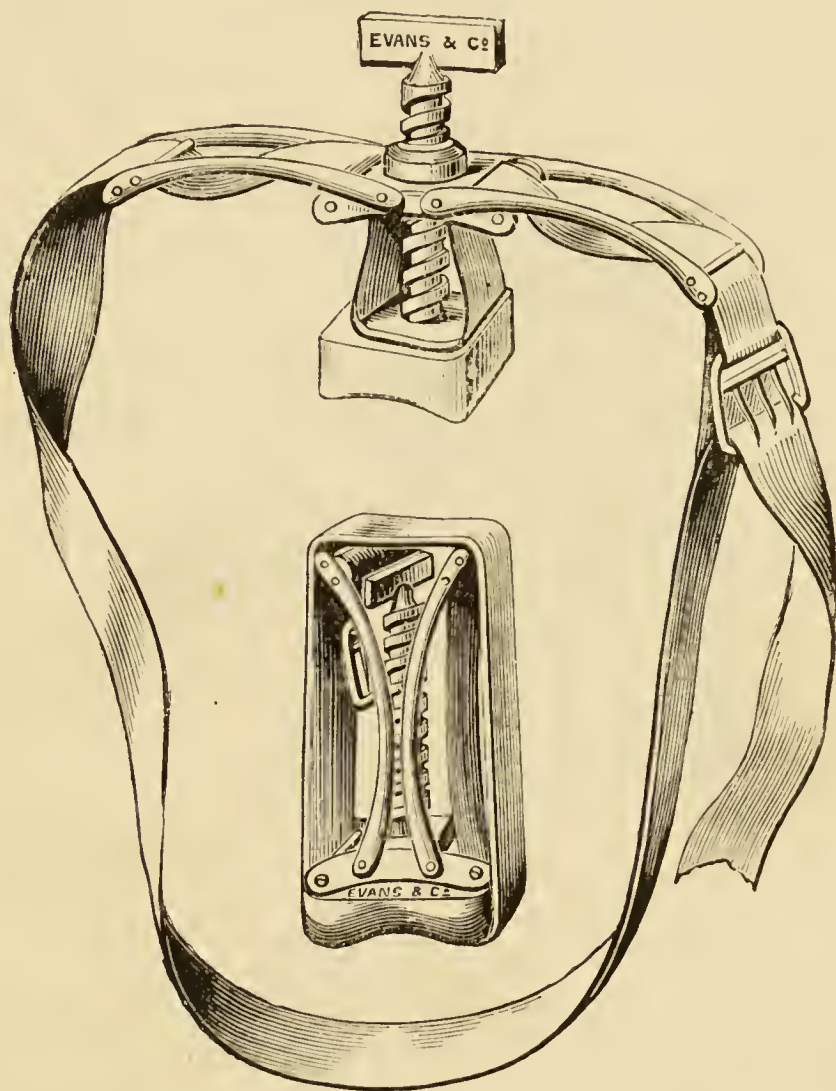


FIG. 5.—Winged field tourniquet.

(2) the pad beneath the screw is next placed on the line of the artery and steadied there ; (3) the strap is carried round the limb and buckled up sufficiently tight to steady the tourniquet ; (4) the screw is finally turned till the hæmorrhage is just arrested. This is an instrument of great power, and the screw must be very moderately brought into action.



**Improvised Tourniquets** may be made of a handkerchief or triangular bandage for the strap, with a smooth stone, cork, or anything small and smooth enough folded up in it, to act as a pad (Fig 6). The wrapped up stone, &c., being placed over the artery, the bandage should be passed twice round the limb and tied loosely in a knot on the outer side: between the two encircling bands thus formed, insert a bayonet or stick for a screw, and twist it round till suffi-

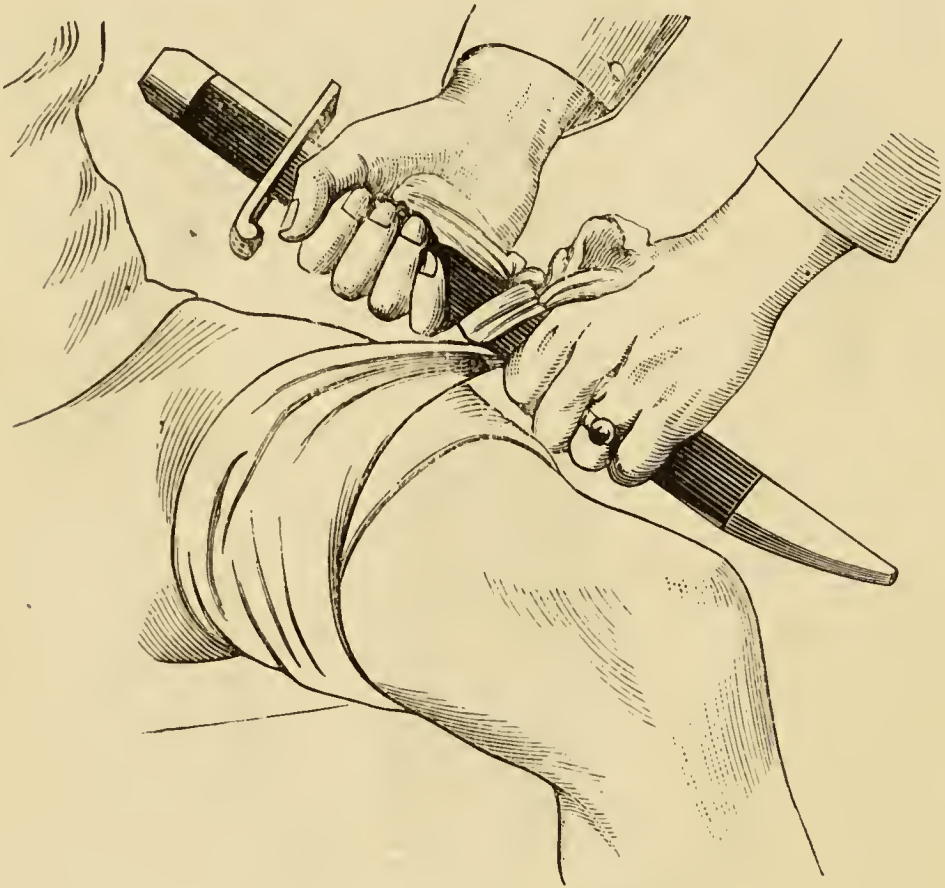


FIG. 6.—Improvised tourniquet.

cient pressure is effected by the stone to stop the bleeding in the wound. To retain the bayonet or stick in place another bandage must be tied round the limb, but only tightly enough to keep the bayonet after twisting the first bandage, from springing round and so relaxing the pressure of the stone.

If the bandage used as a strap for the stone be too short to encircle the limb twice, the bayonet or stick must be



passed between the one fold of the bandage and the skin ; but to prevent painful pinching of this, a thin bit of wood, bark, leather, or something flat, should be placed between the bayonet or stick and the limb. By tying the knot *loosely*, I mean tying the bandage so as to leave room to insert the bayonet and enough loop for it to twist.

*Popliteal Artery*.—This vessel may be compressed by placing a firm pad,—a small roller bandage covered with lint forms a good pad,—in the ham, or popliteal space, the hollow at the back of the knee-joint. The leg should be flexed or bent up against the thigh, and secured in this position by a triangular bandage looped round the lower part of the leg, the ends crossed behind the calf, and then passed up and tied on the front of the thigh.\* Troublesome arterial bleeding from wounds of the leg or foot may be arrested by this method: as it may from wounds of the hand by placing a pad in the bend of the elbow and flexing, or bending, the forearm up over it, and bandaging it to the arm, and thus compressing the *brachial artery* at the bend of the elbow.

## LESSON VI.

BANDAGES — THE TRIANGULAR OR ESMARCH'S — ROLLER BANDAGES, SINGLE-HEADED AND DOUBLE-HEADED — METHODS OF APPLICATION.

BANDAGES are employed to retain dressings and splints in position, to give support to or to exercise pressure upon various parts of the body.

The bandage with which you will have to make your-

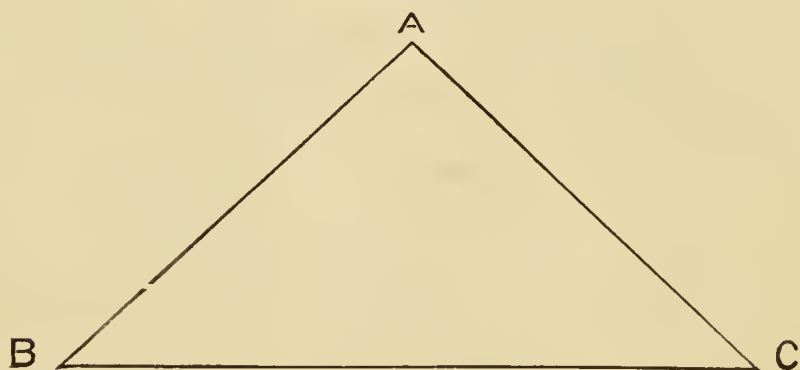


FIG. 7.—ESMARCH'S triangular bandage.

selves thoroughly familiar is that known as the triangular or Esmarch's bandage; and in First Aid assistance, except in the few cases where it is necessary to apply considerable pressure, no other form of bandage need be used; though I should consider this Lesson incomplete were I not to give you some description of the uses and methods of application of the ordinary roller or hospital bandage.

**The Triangular Bandage** is made simply enough—take 1 square yard of calico and divide it diagonally between two opposite corners, thus making two bandages.

Of the three borders of this triangle, from B to C is called the lower, the other two the side borders: A is called the point, B and C the ends.

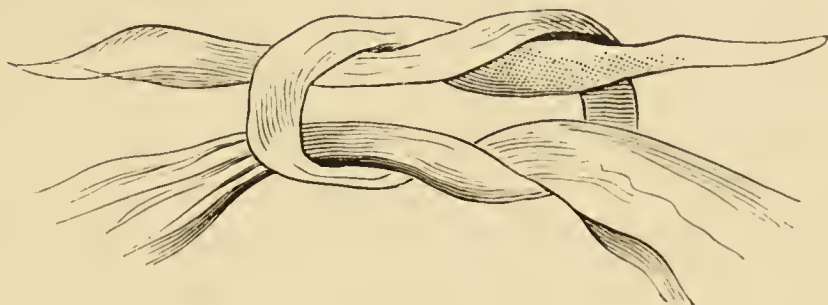


Fig. 8.—The reef knot.

*To make the Broad or Narrow Bandage.*—Spread out the triangle, bring the point A down to the lower border;



FIG. 9.—Triangular bandage, applied to head, shoulder, chest, and arm—back view.

now fold it twice for a broad or three times for a narrow bandage, folding down to the border.

The bandage can be either fastened off with pins or tied in a reef knot (*see* Fig. 8).

These bandages, when not in use, are not to be stuffed away in a wisp, but must be neatly folded as follows:— (1) fold the triangle down the centre, bringing the ends exactly one over the other; (2) bring the (now doubled) point down to the centre of the border, and fold back the two ends to the point, thus making a square; (3) fold this in half, and again fold until you have a pad measuring 3 by 6 inches.

*Applied to the Head.*—Place the middle of the triangle



Fig. 10.—Triangular bandage, applied to head, shoulder, chest, and arm—front view.

on the top of the head so that the lower border lies from ear to ear along the forehead, the point hanging down over the middle of the neck behind. Turn up the border for an inch all round if it covers the eyes, and carry the ends back above the ears to the back of the head *over* the point, crossing them low down under the skull, and continuing them round it till they come to the middle of the forehead; here tie them. Stretch the point downwards behind, so that the rest of the triangle may fit closely to the



skull, and finally bring the point up over the back of the head and pin its apex on top (Figs. 9 and 10).

*Applied to the Eyes or Ears or under the Jaws.*—It is simply folded as narrow as required, applied like a handkerchief, and knotted at one side or over the skull.

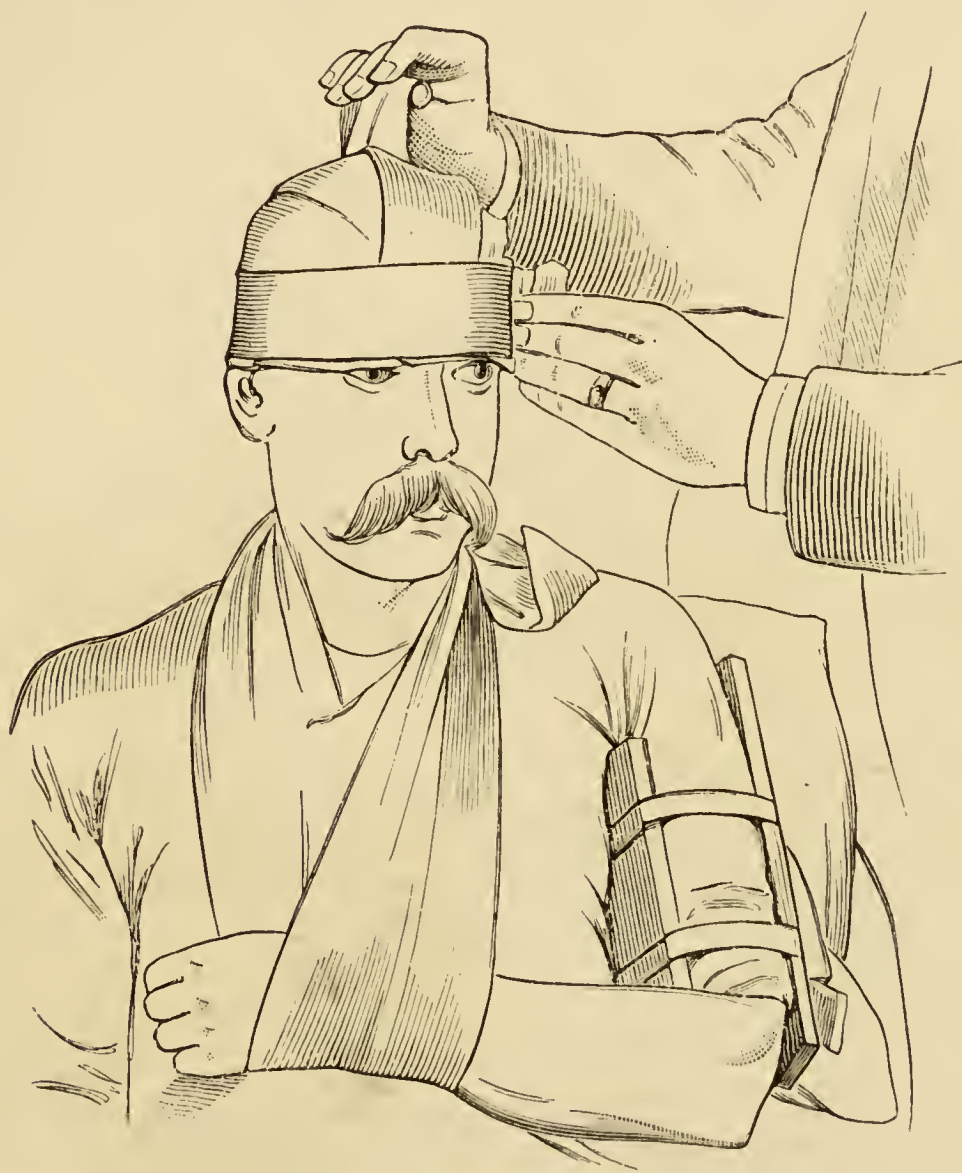


FIG. 11.—The smaller arm-sling. Splints applied to humerus, and capeline bandage in process of application.

*To the Chest.*—Place the centre of the triangle on the chest, hanging the point over one shoulder; carry the ends round the chest, and knot across the back; last, draw the point down, and tie or pin it to one of the ends.

*To the Shoulder.*—Place the centre on the shoulder end of the clavicles and the point up to the ear, the border lying across the biceps. Cross the two ends round the arm, bringing them up again and tying over the biceps.

Take another bandage and fold it narrow; pass it over the same shoulder and under the opposite axilla, and pin or knot it so that it shall cross the chest and back like a

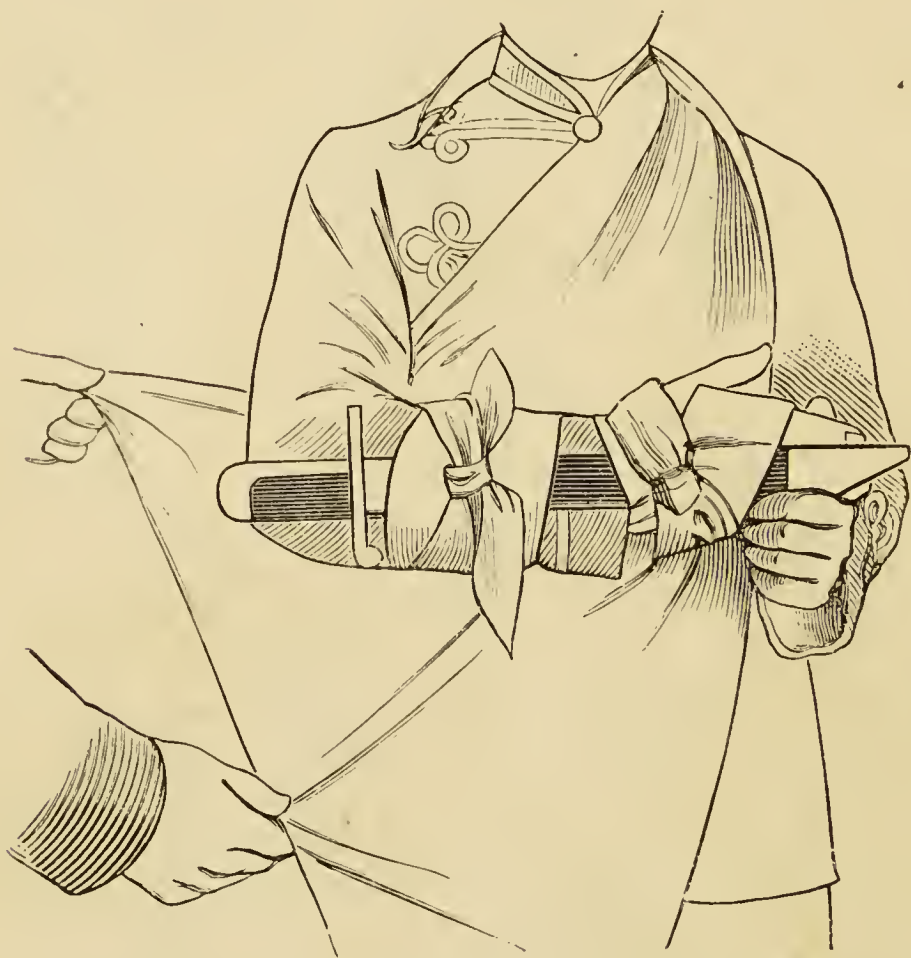


FIG. 12.—Making the large arm-sling. Bayonet splint applied to forearm secured by triangular bandages.

shoulder belt. Pass the point of the first bandage under the belt formed by the second, folding forward the apex of the point, and fix with a pin.

*To the Hip (2 triangles).*—Fold one bandage narrow and fasten round the waist like a belt. Place the centre of the second triangle on the hip, the border lying across the thigh, and the point passed upwards next the skin, under

the waist belt bandage ; pass the two ends under the thigh, out again, and knot on the outer side. Turn the apex of the point over and pin to the waist-belt.

*To make the Small Arm-sling* (Fig. 11).—Fold a triangle broad, throw one end over the shoulder at the sound side, carry it round the collar behind, so that 2 or 3 inches of it may be seen from the front. Bend up the forearm to a right angle with the injured arm, laying the wrist across the middle of the folded bandage. Lift up the end hanging down in front over the shoulder of the injured side, and



FIG. 13.—The large arm-sling completed.

knot it at the collar to the other end. This sling is always to be used in fracture of the humerus, and not—

*The Larger Arm-sling* (Fig. 12).—To make this, spread out a triangle ; do not fold it at all, but pass one end over the sound shoulder round the collar, showing 2 or 3 inches of it over the shoulder at the injured side. Lay the forearm along the centre line of the bandage, so that the lower border may be under and round the wrist (Fig. 12), and the point pointing outwards beyond the elbow ; carry up



the end hanging down in front over the forearm to the shoulder on the injured side and knot to the other end behind. Lastly, draw the point forwards in front of the elbow and fasten with a pin (Fig. 13).

This sling is to be used in fractures of the radius and ulna, as it will form a level bed of support for the whole length of the bones. But were it used in a case of fractured humerus it would tend, by supporting the elbow, to push up the lower fragment of the bone.

*To the Arms, Forearms, Knees, and Legs.*—It is folded narrow or broad, according to the dressing required, passed round and knotted like a handkerchief (see Figs. 10, 12, and 14).

*To the Hand.*—Spread out a triangle, lay the wrist on the border with the fingers towards the point; turn the point back over the hand and over the wrist, carry the ends up over the wrist and point; cross them, carry them under the wrist and then back again, and tie.

*To the Foot.*—Place the sole of the foot on the bandage, heel to the border and toes to the point. Turn the point up over the instep, draw the centre of the border up behind the heel, pass the ends to the front, and cross over the instep, including the point, turn them downwards and knot on the sole of the foot (Fig. 14).

*To the Back.*—Reverse the steps for bandaging the chest (Fig. 10), and knot in front.

*Roller Bandages* are simply strips of linen, calico, silk,



FIG. 14.—Triangular bandage, applied to knee and foot.



flannel, or muslin of varying length and width, rolled tightly upon each other from end to end.

For the fingers,  $\frac{3}{4}$  inch wide, 3 to  $4\frac{1}{2}$  feet long.

For the arm and head,  $2\frac{1}{2}$  inches wide, 3 to 6 yards long.

For the body and legs, 3 inches wide, 6 to 8 yards long.

The rolled-up part is called "the head." With one roll it is a "single-headed roller bandage," with a roll at each end a "double-headed" (Figs. 15 and 16).

It is quite out of the question to apply a roller bandage successfully unless the calico has been very tightly rolled up from end to end, into a solid cylinder, and it is only by actual practice with a roller and an arm or leg that its application can be understood.

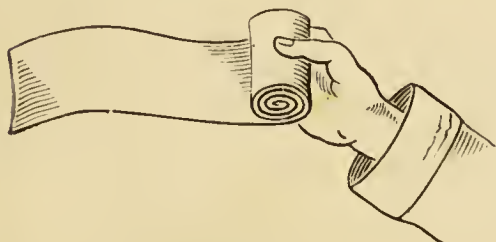


Fig. 15.—Single-headed roller bandage.



Fig. 16.—Double-headed roller bandage.

The following brief directions may help you a little :—

Stand in front of the patient.

Never drop the roller out of your fingers, but only unroll 3 or 4 inches of it at a time.

Hold the roller in the right hand with its axis across the palm, the thumb uppermost and fingers under (Fig. 15). Lay the *outside* of the free end of the roller, using the finger and thumb of the other hand to steady it, on the middle of the length of the limb you are going to bandage. Always place your limb in the position it should occupy when bandaged.

Bandage from left to right, and always from below upwards, always unrolling with the inside of the roller uppermost.

*The Turns of a Roller Bandage.*—Owing to the curves of the muscles and narrowing and swelling into broader circumferences of every limb, no bandage would remain in position if it were simply rolled round and round in spiral turns. To prevent “the spiral” from slipping down after application, and to fit and support the parts evenly, the turns known as the “reverse spiral” are applied to regions like the calf of the leg, large part of thigh, and fleshy part of the forearm.

*The Simple Spiral* covers the part to which it is applied by turns round it, each of which turns overlaps the preceding turn about  $\frac{2}{3}$  of an inch, rolling upwards evenly and spirally till the roller is exhausted (Fig. 17).

*The Reverse Spiral* (Fig. 18) commences like the former, but at the point where it completes each spiral it is turned back upon itself before proceeding with the next turn.

To make the reverse spiral requires considerable practice, the thumb of the left hand should be placed upon the upper edge of the spiral at the spot where the reverse is about to be made, to steady the turn.

By a sharp inward movement of the wrist holding the roller, the few inches of bandage between it and the limb are turned back upon itself, making a diagonal fold downwards; this diagonal fold downwards is the reverse spiral.

The reverses should be at one side of a limb, if possible, and not over a prominent part like the shin, as, if a stiff material is in use, the reverses and folds may painfully compress the skin.

On applying a roller to either extremity, remember to bandage the whole way up from the toes or fingers if the



Fig. 17.—The simple spiral.

bandage is to be worn for any time, as unless this rule be observed the parts below, *e.g.*, the foot or hand may swell most painfully.

Illustrations are given of the application of this bandage.

*The Double-headed Roller Bandage* is applied with both hands, each hand alternately passing a turn round the part.

The bandages for the head and face are called the circular, the knotted, and the capeline.

*The Circular* (Fig. 19) is applied with a single-headed

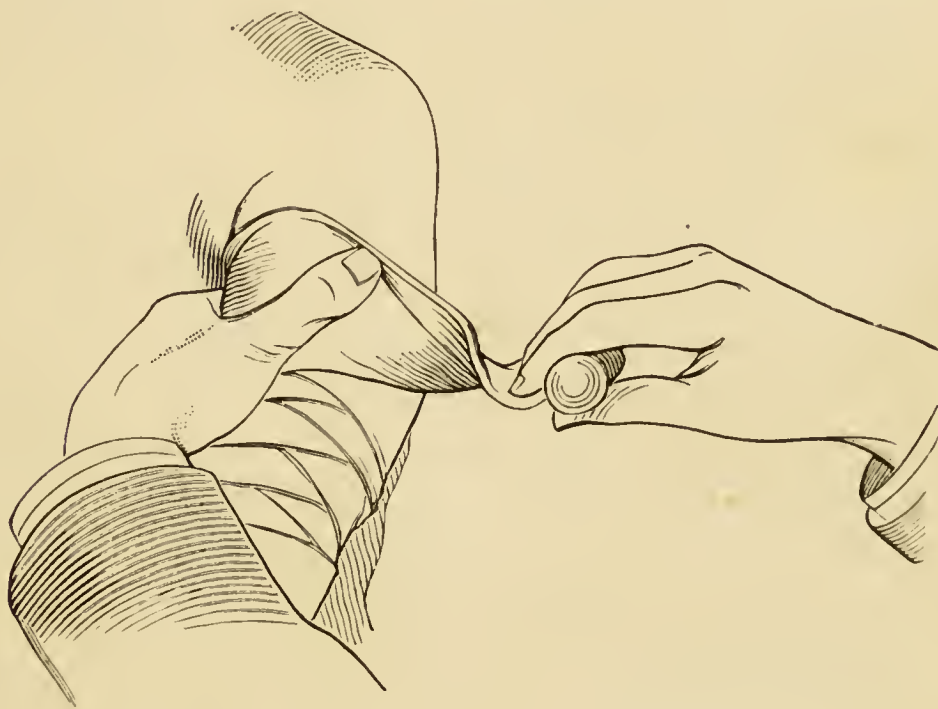


Fig. 18.—The reverse spiral.

roller. Commence by rolling two turns round the forehead and back of head low down, with the edges between the ears and temples. Fix in a pin where the bandage commenced, which should be just in front or over the ear, and pass the roll under the chin and jaws up to the opposite temple; fix another pin here and pass the roll back again under the chin to where you fixed the first pin. This movement may be repeated according to the length of the bandage, or it may be finished off by taking the end right across the top of the head and fixing with a pin over one ear.



*The Knotted Bandage* is a most useful form, as it enables a considerable amount of pressure to be applied to certain points of the head or face, *e.g.*, over a compress applied to the temple in case of bleeding from the temporal artery. A double-headed roller is required (Fig. 16). Take a head of the roller in each hand, and lay the part of it between the heads over the spot you wish to compress. Carry the heads horizontally round the head just above the ears, and cross them over the ear of the opposite side.

You will have to pass the roller head which you hold in your right over to your left hand, and that in the left to your right several times during this application. In crossing the length of the bandage do it tightly, so as to compress the dressing or graduated compress firmly, and, having exchanged rollers with the hands, with a turn of the wrists give a twist to the



Fig. 19.—The circular bandage.



Fig. 20.—The knotted bandage.

bandage, holding the uppermost roller-head firmly, whilst you unroll and pass the lowermost down the jaw, under the chin, and up the face on the other side, to the point where the compress is. To the same point next carry over the roller-head in the uppermost hand, thus bringing the two roller-heads together a second time. Here cross them over the compress and carry the ends horizontally round the head again to the opposite temple as at first. Cross again, changing hands, and pass the rollers as before under the chin and over the



head to the compressed temple. Repeat, applying the bandage in these two directions till all is unrolled, and fix off the ends with pins (Fig. 20).

The knotted bandage may also be made with a single-headed roller if the roller be first unrolled for about twelve inches, this unrolled end being kept in the left hand close to the temple or other part of the skull over which the pressure is desired : the roll is then carried round the forehead and back of the head to the unrolled end, over and round which it is sharply twisted, then being carried down under the chin, up the other side of the head, and over it again to the

starting point, where again a twist is made, and the roll carried horizontally round the head, again a twist and direction downwards under the chin, finally knotting off over the pad or dressing by tying the ends together.



Fig. 21.—The capeline bandage.

*The Capeline Bandage* used to be applied when it was desired to apply dressings to the whole of the head. The triangular bandage applied as a cap has now almost supplanted it.

I have given a cut of this bandage (Fig. 21), but do not describe its application, as my experience is that no amount of printed instructions will teach a pupil how to apply it ; practical demonstration at the hands of the instructor being essential in this, as, indeed, in the application of all bandages (*see also* Fig. 11, showing the bandage being applied to the head).

*To secure Splints with Triangular Bandages.*—Round a thick part, like the thigh or knee, prepare the triangles by folding them broad. Round a thinner part, like the leg, ankle, forearm, or wrist, fold them narrow.

Pass the tip of the end of the folded bandage under the limb, and splint from the outside ; in case of fractures of

course steadying the limb and splint with the free hand, passing about  $\frac{2}{3}$  of the calico under by gently drawing inwards, till the broad part of the bandage when folded upwards will embrace the outside of the splint and limb. Pass the longer part (the  $\frac{2}{3}$ ) from within outwards above the limb, down the outside, and again under it and the splint, bringing the end outwards again, and knotting on the outer side over the splint.

To avoid disturbing a fractured thigh, apply the bandages thus :—After folding to the required width, make a loop by folding the prepared triangle once on itself at the centre, *i.e.*,

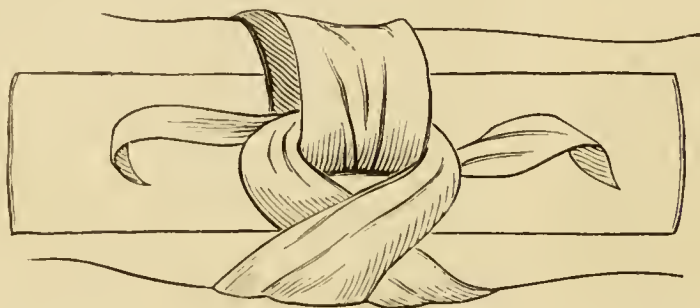


Fig. 22.—Securing splints with the looped triangular bandage.

making the bandage half its length by folding it in two. Pass the loop gently under the splint and thigh from the outside (Fig. 22), drawing it sufficiently under to come well over the limb and upper edge of your splint or rifle. Now take one of the ends, pass one through the loop from left to right, pass the second through from right to left. Draw steadily on the two ends, and the whole bandage will be evenly and gradually tightened, embracing limb and splint ; finish off by tying a reef knot (Fig. 8) over the splint. Tie all your knots over a splint, and not over the flesh or bones.

## LESSON VII.

### SPLINTS—IMPROVISED SPLINTS—APPLICATION OF, TO SPECIAL FRACTURES.

A SPLINT is an appliance made of almost any material possessing sufficient rigidity when applied to limbs or parts of the body, to keep them at absolute rest.

The ordinary hospital splints are of hard wood, hollowed out to fit the curves of the limbs to which they are to act as supports, and perforated with bevelled apertures, so as not to press upon bony projections, like those at the hip or ankle.

There is hardly an end to the catalogue of materials which might be mentioned as used for splinting; thus, in addition to wood there is iron, tin, zinc, wire of various metals, felt, leather, guttapercha, cardboard, starched calico, plaster of Paris, &c.

*Improvised Splints* may be made by using any articles of common everyday use long and strong enough for the purpose. Those which are always within reach on military service are—rifles and cleaning rods, bayonets, sword-bayonets and scabbards, sabres and scabbards, sticks of signalling flags, drumsticks, handles of pioneers' tools, entrenching tools, telegraph wire. In civil life almost everything—pitchforks, broom-handles, walking-sticks, umbrellas, fire-irons, boards, firewood, boughs and twigs broken from trees, wire, cardboard, newspapers folded up, basket work, straw, &c. &c.

All splints applied in hospitals are lined with pads of tow,



cotton, wool, or other soft material. In applying improvised splints, folded handkerchiefs, dusters, grass, hay, soft paper, &c., is better than nothing, as the application of hard splints tightly bandaged on, as they must be in fractures, without some sort of intervening padding is painful. For this reason amongst others—though it is as well here again to mention the principal one, and that is that you should disturb an injured body or limb as little as possible after an accident—in rendering First Aid the clothing should never be removed from limbs or disturbed, except, of course, where hæmorrhage is present, then it will be necessary to unpick the seam of trousers or coat sleeve to control the bleeding.

Splints when applied should be long enough to reach from the joint above the fracture to that below it; thus, in fracture of the femur we try to find a splint long enough to reach from the axilla to the ankle; and to lessen the liability of movement between the broken ends of a bone, a splint should be applied to the inside of a limb as well as to the outside, and in the case of a heavy bone, like the femur, a third splint may with advantage be applied to the upper surface of the thigh to prevent the fragments tilting up.

In all cases of fracture, unless very careful handling is employed, very serious consequences may follow. The probable result of carelessness in applying splints and in lifting the patient off the ground is the conversion of a simple into a compound fracture. In a case—a most frequent one—where the shaft of a long bone is fractured obliquely across, there are spiked and jagged edges to the fragments; the muscles around the seat of fracture are very liable to be impaled, and even the outer skin broken through, and important blood vessels torn, if the broken bone is allowed free movement. Hence the invariable rule in fractures of the lower extremities, on no account to attempt to raise a patient or lift him into a stretcher or conveyance of any description until splints have been



applied sufficient to ensure immobility of the ends of the bone fractured.

Under the heading of Wounds I shall enter more particularly into the treatment necessary before applying splints in cases of compound fracture.

*Fractures of the Skull.*—If a man is found quite unconscious, and there is blood oozing from an ear or from the nose, it may be a case of fracture of the skull. There is nothing here that the bearers can do except to transport the case to the nearest surgeon; but in lifting the wounded great attention must be paid to the support of the head and neck, which must not be allowed to roll about; and when the man is placed on the stretcher, before moving off, a greatcoat, or cape, or valise must so be disposed at the head as to keep it from rolling from side to side in transit.

*Fracture of the Jaw* (or lower maxilla).—After applying a first dressing to any existing wound, fold a triangular bandage narrow, place the centre under the chin, pass each end up on either side of the face, and knot on top of the head; or—

The ends may be continued over the top of the head, brought down again, and tied under the chin, if the bandage be long enough.

*Fractured Spine* is either followed by instant death (if the seat of fracture be above the third cervical vertebra) or by well marked paralysis, or loss of power, of all the parts of the body below the seat of the injury.

No splint is of the slightest use in such a case; all that can be done is to place the patient as gently as possible on a stretcher on the flat of his back, and transport him to hospital very slowly, to avoid jolting, the least shaking or jerking of the stretcher causing the sufferer most intense pain.

*Fractured Clavicle.*—The routine treatment is to make a wedge-shaped pad, placed base uppermost in the axilla of the injured side, which may be bound on by a triangular

bandage, folded narrow, passed under the pad, the ends carried up, crossed on top of the shoulder, passed round the neck, and tied on its opposite side ; or, if the triangle is long enough, passed under the opposite axilla and fastened. The arm on the injured side is then to be folded across the chest and retained there by a second triangle, folded broad, encircling the chest and arm.

The object of this is to support the point of the shoulder, which, with the weight of the humerus and forearm, has dropped. This end may be attained by a process much more simple, viz., by applying the *larger arm sling* by the following method to the injured side, which will support the humerus and forearm well and will ease the pain :—Take a broad folded triangular bandage, place one end over the shoulder on the sound side, carry it round so as to lie over the opposite shoulder, allow the other end to fall down, bend the arm carefully and place the wrist across the middle of the bandage, with the hand a little higher than the elbow, and bring up the end in front of the forearm, passing it under the armpit of the injured shoulder, and knotting off behind, pinning the point round the elbow. This method prevents pressure on the seat of injury.

*Fractured Ribs.*—The sufferer on attempting to breathe will be unable to complete the act from pain, the same on coughing or on exerting himself, and there is sure to be a history of a fall or a blow on the side. Fold a triangle broad, placing the centre over the injured ribs, draw it smoothly round, and pin at the opposite side. This is all that you can do, unless you have a roller bandage, which, rolled firmly and evenly round the chest from below upwards, affords great support and lessens the movements of the ribs, thus relieving pain.

*Fractured Humerus.*—The arm is useless, and there is pain in the upper arm. Any attempt at movement will probably elicit a grating sound, or crepitus.

If it is necessary to inspect the arm to apply a dressing

or compress to a wound, do not attempt to pull up the coat sleeve ; but, beginning at the wrist, unpick the stitches with a knife, choosing the inside seam, right up to the shoulder, and the same with the inner seam of the shirt sleeve. Each stretcher is supposed to be supplied with two pairs of field splints made of cane—one set for the upper and one for the lower extremity—ready padded, and provided with web straps and buckles. If you have a pair of these, apply the shorter to the inner side of the humerus, and the longer to the outside (Fig. 11).

Get a fellow-bearer to steady the shoulder and upper fragment, and make extension by slowly and firmly pulling downwards, grasping the arm with one hand at the elbow, so as to support the forearm, and with the other grasping the arm at the seat of fracture, by passing all the palm and fingers below and the thumb only above, making a bed of your hand. When sufficient traction has been made downwards, buckle the straps tight enough to prevent movement, doing this very carefully for fear of displacing the fragments. Support the arm, whilst another bearer prepares a *small arm sling* (Fig. 11), and places one end over the sound shoulder, then bend the forearm up so as to lie across the small arm sling at the wrist, lift up and knot the hanging down end of the sling.

I recommend that each field companion should be furnished with light pieces of pine wood for splinting, enough to supply a rectangular splint for the under splint, and three others.

The under (rectangular) splint gives perfect support, and steadies the fragments better than any other. It is readily prepared, with no more elaborate tools than a pocket knife, a small brad-awl, and a few inches of copper wire. The longer piece need not be more than 12 inches in length for the support of the forearm, and that at right angles to it, for the humerus, an inch shorter. Of the other three pieces, the inner may be 5, the outer 8, and the front 8 inches.



These three, with the rectangular, when applied either with straps and buckles (2 pairs of which should be carried by every bearer), or with triangular bandages, make an immovable case for the fractured bone. Fig. 23 shows the whole set of five, two of which are wired together. A shoulder should be pared away with the knife at an end of each of the long pieces, so that they may be spliced together by lacing the wire in and out of the six holes bored through each end. No greater width than 2 inches is necessary for the wood.

Failing splints of this sort, pass a triangle, folded broad, round the seat of fracture, and fix with pins, if possible ;

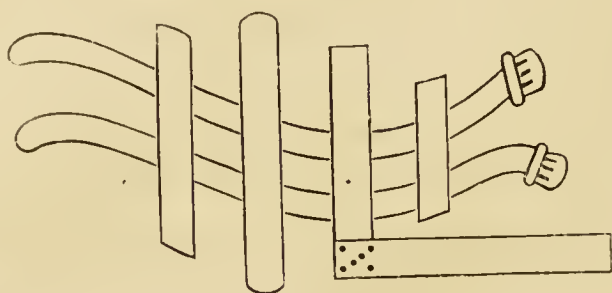


FIG. 23.—Simple field splint for fractured humerus.

extend and apply a bayonet scabbard inside and bayonet outside—a very awkward splint indeed (Fig. 23).

*Fractured Radius and Ulna, or either of these.*—When only one bone is broken there may not be much displacement, or none at all. Bend the forearm up across the chest, upon a *larger* (Fig. 13) arm sling, with the thumb and radius *uppermost*, and knot up the sling.

When both are broken, place the forearm in the same position, but apply a bayonet and scabbard (Fig. 12) outside and inside the forearm—the bayonet outside, point along the hand—large sling, as before. If you have cane or wooden splints use them, buckles and straps if possible, triangular bandages otherwise.

*Fractured Femur.*—There is usually no doubt about this accident ; the patient not only cannot stand but makes no



effort to do so, as there is complete inability on the injured side, the toes and foot pointing helplessly outwards.

Three bearers at least should attend to this. Having collected your improvised splints—for the long outside splint a rifle (Fig. 24), for the inner a sword bayonet *in its scabbard*, and for the upper a flat wooden or cane splint, or another bayonet—get your triangles ready. You will need at least five bandages, sometimes six. The man's own waist-belt is supposed, in all cases, to be long enough to use as an upper bandage, to brace the rifle to the thigh; but, as a matter of fact, it often is not so, and you will have to pass a triangle under his loins. Whilst one bearer steadies the limb, prepare your triangles. You will want two (better three) for

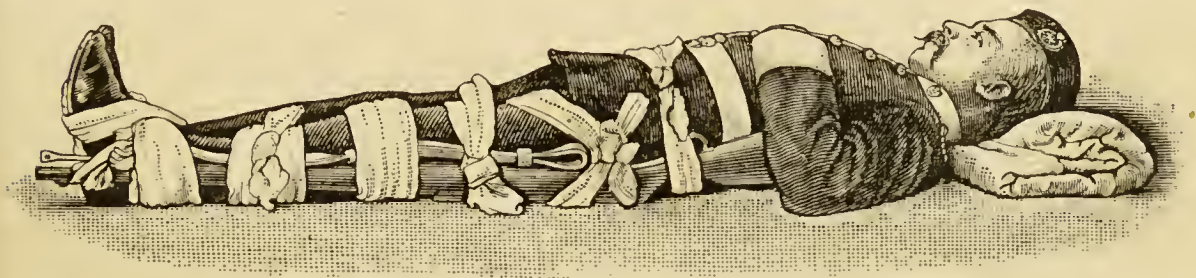


FIG. 24.—The rifle splint.

the thigh and knee, and one for the ankle and foot. Sometimes an attempt is made to maintain counter extension by means of passing a triangle, folded narrow, along the folds of the groin above and buttock underneath, and fixing the ends to the sling buckle on the butt. Even if the object intended is not attained, this additional bandage can do no harm, as it will help to support the rifle. Pass your bandages under, disturbing the limb as little as possible, place the rifle alongside, butt in axilla, trigger upwards. While one bearer extends by traction on the leg and foot (which should be brought so as to point directly upwards), the second counter extends at the groin, the third adjusts first the rifle, then the inner and upper splints. All this time bearers 1 and 2 must keep up traction. No. 3

fixes the waist-belt or bandage, next, one round the middle of the thigh (or two), then one at the knee, and lastly, one at the foot. This last triangle must be folded narrow, must pass under the sole of the boot, just in front of the heel, like a stirrup, must cross over the instep, back behind the ankle, and must embrace the barrel of the rifle, between it and the cleaning rod. The sound thigh had better be bandaged also to the fractured before lifting, and four bearers should lift. When it is necessary to inspect the limb, before applying the splints, unpick the *outer* seam of the trousers.

*Fracture of the Patella.*—A flat splint placed lengthwise behind the knee, and secured both above and below.

*Fractured Tibia, Fibula, or both,* require splints from above the knee to the ankle. The application is the same as for fractured femur, for a rifle will often have to be used, bayonets being seldom long enough by themselves, especially the new sword-bayonet. The sound leg should be bandaged to the fractured before lifting.

Always examine a rifle closely if you intend to use it as a long splint; open the breech, and, if it is loaded, remove the cartridge.

## LESSON VIII.

WOUNDS — GUNSHOT WOUNDS — FIRST DRESSINGS — BURNS  
AND SCALDS — MINOR CASUALTIES — DISLOCATIONS —  
SPRAINS—FOREIGN BODIES IN THE EYE—WASP STINGS,  
ETC.—FROSTBITE—BAYONET AND SABRE WOUNDS.

THE wounds most common in the present day on active service in warfare are, of course, those due to gunshot injury. These vary much in their nature, from the very slightest contusion up to terrible laceration of the tissues, with fractures of every description, and carrying away of whole or parts of limbs. After an injury from gunshot, the wound should be examined as early as possible ; its extent, and the nature of bleeding from it ascertained.

The wounds produced by rifle bullets at speed are, at the wound of entry, often small, round, with clean and turned in edges ; at the wound of exit sometimes large, and presenting a torn appearance, the edges protruding.

The amount of hæmorrhage varies, of course, with the size and number of the blood vessels wounded, and also with the behaviour of the bullet and the part of the body struck ; in a wound of the chest there may be, for example, apparently only trivial hæmorrhage to the eye from the wound, whilst all the while fatal inside hæmorrhage may be going on in the cavity of the thorax.

Under fire, First Assistance in cases of gunshot wounds consists of (*a*) checking hæmorrhage ; (*b*) applying a first field dressing ; (*c*) removing the injured to the rear.

The methods already described (Lesson V.) must be



employed to check bleeding ; a tourniquet or improvised tourniquet must be instantly applied to the femoral or brachial artery for extensive wounds of the lower extremity or of the arm or forearm ; and to wounds of the armpit, and neck and head, digital compression of the subclavian or carotid if the bleeding is arterial. In wounds where minor arterial branches are divided, a properly applied graduated compress must be arranged.

In wounds of the palm of the hand often the most troublesome bleeding takes place, and, from the difficulty of applying pressure, persists. Here, after applying a compress in the wound, if the hæmorrhage continues, place a roller finger bandage, to form a hard pad, in the hollow of the elbow, forcibly bend back the forearm on the arm, so as to hold the pad there, and bandage the forearm tightly to the arm.

If you actually see foreign bodies in the mouth of a wound, such as bits of cloth, splinters of wood, pebbles, or other foreign bodies, it is absurd to attempt to dress the cut over all these and so press them into the wound. Do not be afraid to remove them. Take them out, if you can do so without tearing the wound larger ; gently lift up the edges to see that no artery is pumping, and if it is, put your finger or thumb into the wound, pressing the bleeding point sufficiently to stop the loss of blood until a fellow-bearer prepares a compress. If you are alone, do not let your presence of mind desert you. You ought to have in your pouch some lint already cut into small squares, and if your pouch is worn in front of the belt there can be no difficulty in reaching these. Do the best you can with your one hand, never letting go your pressure on the artery with the other, till sufficient lint has been *packed*, not just loosely stuffed in remember, into the wound to stop the hæmorrhage.

Wounds with venous or capillary hæmorrhage only require to be cleaned out, *i.e.*, removing any foreign bodies lodged in them, to have the cut edges adjusted as far as possible,



and a pad made of one or two folds of lint placed over the wound and bandaged on. Pressure by a good pad over a wound with only venous or capillary hæmorrhage will always check it, aided by position, *i.e.*, by elevating the limb and removing any constricting clothing above likely to check the return venous circulation ; and, let me again remind you that such articles as belts, straps, garters, braces, trouser waist bands, a trouser leg or coat sleeve rolled up round a limb, are examples of constricting clothing.

The dressing, consisting of lint either dry, or, if at hand, smeared with simple ointment or oil, or moistened with water, need not be more extensive than just to cover the actual wound. Putting on a piece of lint 5 in. square thickly smeared with ointment over a wound perhaps  $1\frac{1}{2}$  in. square is a ridiculous proceeding. First field-dressings<sup>1</sup> are carried by each soldier going into action, or should be, and consist of antiseptic lint in two small squares smeared with ointment, folded upon themselves and wrapped in oiled-silk or waxed paper ; a little spare lint ; one triangular, and one thin roller, bandage ; and a tally label.

*Wounds in Compound Fracture.* — You have here two serious complications — the fracture, perhaps multiple, in which the bone is much splintered, and the wound, or perhaps, wounds. First check the hæmorrhage, if arterial, by digital pressure or by tourniquet ; whilst this is being done have the limb held steadily by a second bearer. Place a light dressing over the wound, and let your inside splint be placed in position all this time so that the fragments may be moved as little as possible. Over the dressing place a pad of lint sufficient to keep out the air, and to take off the pressure of the outside splint ; pass the requisite number of triangular bandages, folded narrow or broad, under the limb, and, with the assistance of a third bearer, extend and counter extend ; secure the splints with the

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<sup>1</sup> See Note, p. 72.

bandages, applying an extra bandage or splint if necessary to check any movement. In those cases where, from arterial hæmorrhage, you have been compelled to apply a tourniquet, lose no time in obtaining a surgeon to see the case ; and never lift the man off the ground to a stretcher without bandaging both legs securely together.

When hæmorrhage persists, but where there is no evidence of an artery pumping or of a vein welling out blood, remember that often the slightest constriction above the wound may impede the return venous circulation to the heart, and inspect the clothing again to see if you have overlooked any constricting article or part of the dress, elevate the limb by placing a rolled great-coat and valise or two under it, this may cause the hæmorrhage to cease. But if these measures fail, you had better plug the wound. Now if this is done carefully and thoroughly, the hæmorrhage must cease for a time.

Whatever material you are going to use—pieces of lint, cotton wool, or sponge—to be of use, the whole of the wound must be tightly packed with it, so that all the bleeding points within may be compressed sufficiently to prevent the escape of blood.

In writing of this method of checking troublesome bleeding, Mr. Walter Pye says :—

“ The best materials for plugging are (1) sponge in small pieces, quite dry, and compressed until they are hard ; (2) strips of lint not more than three-quarters of an inch wide ; (3) cotton wool. Of these, the first, sponge, is by far the most effective, although it is not so easy to apply. The best way is to take quite small pieces, and, after drying them as far as possible, to pack them into the wound with a short director until they are firmly compressed by its sides.”

The lint may be introduced in the same way, remembering to put in small pieces, packing them right down to the bottom of the wound.

Cotton wool is only to be employed when neither sponge nor lint are at hand, and should be squeezed out in water

first. The wound, when plugged, requires a pad of lint over it and a triangular bandage ; and plugging the wound is only to be resorted to when the simpler means of arresting hæmorrhage have failed ; the objection to this method being that every one of these bits of sponge, or pieces of lint, must be removed from the wound by the surgeon, and should the smallest bit be left behind, it may interfere most seriously with the healing of the wound. Instead of a director, the end of a wooden lead pencil may be used on emergency, and it is sometimes better, if the wound is extensive, to make a hollow cone or bag of lint, by pushing the centre of a piece of it, cut square or round, into the wound deeply down, and then filling this bag or cone thus formed with the scraps of sponge, lint, or wool (the latter here makes a very convenient packing), pressing them in closely so as to make a tight mass of lint or sponge in the wound. The advantage of this method is, that upon removing the plug none of the small pieces are left behind.

*Shock in Gunshot Wounds.*—After any grave accident, the sufferer is usually found in a state of insensibility, the condition known as *shock or collapse*. But in the field of battle, when the nervous system is overstrained, a very slight injury may produce shock ; for instance, in some moment of extreme excitement, as in the charge, the slightest blow or cut, the mere graze of a bullet or a trifling laceration, so slight as under ordinary conditions to cause little nervous disturbance, will fill some men with such a sudden revulsion of feeling, such an uncontrollable agitation, born of a sense of personal danger and of fear that the injury may be a death-wound, that they will be unnerved, grow pale, stagger, *faint*, and fall to the ground.

This state of shock, fainting, or *syncope*, will, in the event of really an extensive injury, such as the loss of a limb from a cannon shot, or a fair hit from a rifle bullet wounding the tissues or smashing a bone, be brought about not only by the sudden nervous anxiety alluded to above, but, in addi-



tion, by the pain caused by the actual severance and contusion of nerve trunks, and also by loss of blood from lacerated vessels. To a certain extent, and contradictory though such a statement may appear, this state of shock is a fortunate condition of affairs for the wounded man ; for if the bleeding has been free and the patient faints, during the faint or syncope the action of the heart will be much less forcible than had consciousness continued, with the result that but little blood will be forced along the lacerated vessels. Secondly, the muscular coats of the torn arteries here render yeoman's service by contracting ; you will remember that in Lesson V. it was stated that arteries had an envelope of muscular tissue, and that muscle when under stimulus such as irritation (and a tearing of tissue is one form of stimulus by irritation) responded to the stimulus by contraction ; the contracting lessens the calibre of the torn end of the vessel, the blood cannot escape so freely, hence less hæmorrhage. Thirdly, blood has the property of clotting or coagulating when coming into contact with the air ; this clotting taking place not only on the surface of the wound, but for a short distance up the severed tube of the vessel, already narrowed by the contraction and retraction of its coat of muscle ; the clotting seals or plugs the ends of the vessels, thus arresting the bleeding, provided the arteries wounded are not of the largest size, and that the patient does not quickly come to, for in this latter case the heart resuming its action would pump on the blood stream with its usual force, disturb the clots, and continue the hæmorrhage.

From a consideration of these wonderful phenomena, which occur in what is known in surgical language as *the natural arrest of arterial hæmorrhage*, I wish you to learn this, and if by the study of this chapter or Lesson you carry away in your heads nothing more, it will be an invaluable item of knowledge gained—that when you are dealing with an extensive wound, in which you know arteries must have been injured, and yet you can see no sign of one



pumping out blood, do *not* be in a hurry to rouse the patient by going through the customary routine of bringing him to, it is better for a while that his *syncope* should continue, and do *not* interfere with the wound by washing and turning up its edges or by putting your finger or thumb into it. By meddling such as this much harm may be done, for you may disturb nature's seal,—the clot,—and violent hæmorrhage may follow; rather keep the wounded man quite still lying down, and apply a tourniquet to the main artery above the wound until the surgeon comes. And in the matter of giving brandy, &c., do *not* give it, for this quickens the circulation, and the clots may be swept out of the orifices of the torn arteries.

*Gunshot Injuries of the Head, Chest, and Abdomen.*—These wounds are usually so severe and the parts, if penetrated by shot, so vital, that a profound state of shock or collapse almost invariably accompanies them. In these cases the strict rule is to *interfere as little as possible*. The wounded man must be placed in the recumbent position, all tight belts and clothing loosened, and, except where arterial bleeding is visible, no active interference need be attempted. If moving the cases to the rear is absolutely imperative, the lifting and subsequent bearing off the field must be conducted as gently as possible. Over the wound of the chest or abdomen a first dressing of lint may be applied to exclude the air, and if it will stay on, as it should do if smeared with a little ointment, do not disturb the patient to apply bandages. The positions in which to arrange the body and limbs will be considered under the head of “Stretchers and the proper method of carrying wounded.”

**Burns and Scalds.**—Burns, if extensive, produce terrible wounds, sometimes the tissues are involved to a great depth, with consequent hæmorrhage, just as in other wounds. The general principles of treatment are the same for burns as for wounds: the first thing to be done is to check hæmorrhage if it is present, and the second to exclude the air as speedily

as possible. Exposure is to be strictly avoided whilst the first dressing is being prepared; fatal consequences may result from exposing a badly burnt or scalded surface to the air for a minute longer than is necessary; interfere with the burnt surface of the wound as little as may be, but if you distinctly see foreign bodies on the surface, remove them before applying the dressing. These foreign bodies in gunpowder burns may include scraps of cloth and of underclothing, bits of metal, and small hard pellets of unexploded powder. Any of these that can be picked off the surface easily may be removed, but on no account must it be disturbed by dragging or pulling at anything at all adherent. Any portion of clothing involved must be carefully *cut* away with scissors. If it is possible to obtain oil, thoroughly cover it with that, and the skin near the burn also, then apply lint either oiled or dry, and over the lint cotton wool bandaged on. If no oil or ointment can be procured, and the latter articles can be utilised, dust thickly over the wound flour, powdered whiting, Fuller's earth, or starch powder, and if neither of these, cover over the part quickly with lint and cotton wool.

*Scalds* may be treated in the same way. When removing the man on a stretcher—and even in slight burns or scalds, it is wise not to let him exert himself after the accident by walking—see that the body is well protected by additional coverings, blankets, or greatcoats being thrown over it.

In skin burns from gunpowder, oil the burnt surface and try to pick out any unexploded grains of powder sticking in it. Sponge out the spots with a wet sponge, as if this is neglected much staining and disfigurement may result.

*Spitting up, or vomiting blood, and bleeding from the Nose.*—Internal bleeding can only be treated by making the patient lie down with the head just a little raised, and giving him ice to suck, and small quantities of iced drinks. This practically means that in the field nothing can be done except to give a little cold water, and to loosen all clothing. In

bleeding from the nose, let the man lie down on his back—and *not sit up* bending his throat over his collar and hanging down his head, as is usually seen, thereby aggravating the epistaxis, or nose bleeding, by obstructing the return of venous blood from the head—and let the arms be extended at full length above the head, some lint wrung out in cold water being laid on the nose and forehead, and cold water applied also to the nape of the neck.

**Dislocations.**—When a bone which works in a socket or joint is forced out of its proper place, it is called a dislocation. This accident is the result of external violence, but sometimes of enforced and sudden violent muscular action. The limb is immoveable, and any attempt to move it causes intense pain at the very joint where it should move with the greatest amount of ease naturally. You can distinguish it from a *fracture* by observing that in fracture you have increased mobility in a situation where there ought naturally to be none at all. The first aid treatment is to prevent the sufferer from using in any way the dislocated limb. Never try to put in the bone, but support the limb till surgical assistance can be had, by a sling if the dislocation be of the upper extremity, by carriage on a stretcher should the femur or knee-joint be the seat of injury, or by the three or four-handed seat if the ankle, and you need only carry a short distance.

**Sprains.**—Bind up any sprained joint with a wet dressing, or where water is not procurable, with a roller bandage if possible—do not allow the joint to be used.

**Injuries to the Eye.**—The entry of even the most minute foreign body into the eye often causes much pain. Sand, grit, cinder, soot, small flies, tiny splinters of metal, grains of powder, lime dust, &c., are very irritating, and unfortunately the irritation is much intensified by the instinctive first act of the sufferer, which is to knuckle or rub the eye with the hand, by this act frustrating Nature's provision for removing the foreign body by the action of the tears,



which, when it is not imbedded in the eye surface by being pressed in by this knuckling, wash the offending particle away. Place the patient facing the light, and firmly open the eyelids. If you can see any black object on the surface of the eye, fold up a piece of clean white paper into a small triangle, and with one of its points gently try to lift or brush off the foreign body, use no force, and if, after two or three careful attempts you fail, leave the eye alone, contenting yourself by covering it over with some wet lint, and telling the man to close his eyelids. If you know that lime has entered the eye, do *not* put oil under the lids, but do all you can to get some vinegar, mix it half and half with water and bathe the injured eye freely ; afterwards apply lint steeped in vinegar and water. Failing the vinegar, apply wet lint, of course removing first any caked lime you may discover.

Lacerations of the eyeball itself can only have a dressing applied of wet or oiled lint, kept in place by a triangular bandage folded narrow, and tied across the eye.

*Stings* by bees, wasps, &c., are of frequent occurrence in country districts, and often prove troublesome. If you see a case early enough, before much swelling has set in, you may be able to remove the sting by pressing the mouth of a watch or other small key over the end, which you will see as a black speck on the skin ; apply a small strip of lint, with a few drops of sal volatile, or ammonia and water, shaken upon it over the site of the sting ; and apply a wet dressing, wet lint covered with oiled silk over this.

*Frostbite* is not of frequent occurrence here, but you may encounter such a case. When intense cold affects a part of the body so acutely as to stop the circulation of the blood in it, this is frostbite. Numbness, with a feeling of weight in the part first sets in, accompanied by pricking or tingling, and the part becomes red. If the exposure to cold continues, stiffness and loss of feeling follow, and the appearance of the frost bitten part changes from red to a white waxen hue.



*Treatment.*—Much care should be taken in this, for by suddenly bringing the patient before a fire, the circulation will be restored hastily to the frozen part and cause engorgement of blood, followed by gangrene or mortification. Bring the man in out of the cold, but away from a fire, undress, and roll him in blankets, laying him flat. Restore the circulation by friction with the hands in the direction of the heart, rubbing from the feet to the groins, and from the hands to the shoulders. This must be persisted in for some considerable time, until you know that the circulation is becoming less sluggish by finding the pulse beating more strongly and the body warmth increasing. Friction with snow or iced water is the common practice in Canada and Russia, but these are not essentials. Wrap the frost bitten part in cotton wool if available; promote the warmth of the body when the circulation has returned by administering food warmed, such as beef tea, with a little wine or spirits.

*Poisoned Wounds.*—The most familiar are those caused by bites from dogs, horses, or vipers. The object of the treatment is to prevent the poisonous material introduced into the wound by the teeth of the animal or snake from being carried into the circulation. To prevent this all that you can do is at once to pass a tape or string several times very tightly round the limb bitten, *above the wound*, and to wash it well with warm water if any is procurable. A little bleeding may be rather encouraged than stopped; subsequently, apply a wet dressing till the wound is seen and treated by the surgeon; do not apply caustic, as is the common practice, for it is utterly useless. Wash the wound in any case, and here it will not be out of place to say that the best sponge to use in washing a wound is a ball of clean cotton wool, and not a sponge at all.

*Bayonet and Sabrecut Wounds.*—In these injuries there is always the element of chance; the wounds may prove instantly fatal, or shortly so, in proportion to their depth and to the part injured.

In the former, when a man is found in a state of collapse, it is extremely difficult to ascertain the extent of the injury. With the triangular bayonet the outer extent of the wound may mislead you as to the severity of the injury, for with it may have happened very deep penetration into the body, with puncture or laceration of some most vital organ, or the severance of a large vessel. The bleeding may be almost all going on inside the body, little or none appearing at the mouth of the wound. A sword cut may be either a gash or a superficial skin wound, accompanied by bruising, depending entirely upon the manner and direction in which the cut was given. Hæmorrhage is a certain accompaniment of both classes of wounds, but in bayonet thrusts none may be visible to the eye. The treatment in these, as indeed in all wounds, is the same; first, the arrest of hæmorrhage, and then the application of a dressing so applied as to bring the edges of the wounds into apposition, supported by suitable bandages.

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#### NOTE.

**First Field-Dressing.**—The new first field-dressing consists of a compressed pad of flax charpie (antiseptic), a piece of gauze, a gauze bandage, two covers, and two safety pins; forming a packet which is sewn into the coat of every soldier going on active service.

## LESSON IX.

### SPECIAL EMERGENCIES AND THEIR IMMEDIATE TREATMENT —DROWNING—FITS—POISONING.

**Restoration of the Apparently Drowned.**—Drowning is one of the forms of death by asphyxia or *suffocation*. In drowning the entry of atmospheric air into the lungs is suddenly prevented. The little remaining air in the air cells of the lungs at the time of the immersion being entirely cut off from a supply of oxygen, remains charged with carbonic acid, *i.e.*, in a highly impure poisonous state. This venous or carbonised blood rapidly poisons the whole body and affects the nerve centre in the brain governing respiration. Insensibility from poisonous blood only circulating in the brain follows, then extreme nervous exhaustion and paralysis of the diaphragm and of the muscles working the ribs; later on the heart is paralysed, ceases to beat, and death is supreme. As the heart is known to continue beating after the paralysis of the muscles of breathing, if these muscles can be again stimulated into working, it may be possible to restore life. It is with this object then that we practise artificial respiration, a series of movements to imitate the movements of the chest in breathing.

*General Directions.*—For artificial respiration to be of the least avail, the man rescued from the water must be treated at once: whether in a boat or on shore, lose no time in removing wet clothes, but remove and loosen everything that in the least degree confines the chest and hampers the circulation—that is to say, remove coats and waistcoats



tear or cut a tight jersey right down the front, open the shirt so as to expose the chest and throat to the air, loosen braces, belts, and trouser waist-bands, and cut the laces of the boots; cleanse the mouth and nostrils from mud or seaweed, and turn over on the face for half-a-minute to let any water run out of the mouth.

The three approved methods of performing artificial respiration are, (1) Sylvester's, (2) Marshall Hall's, and (3) Howard's. In describing the first two, I shall give

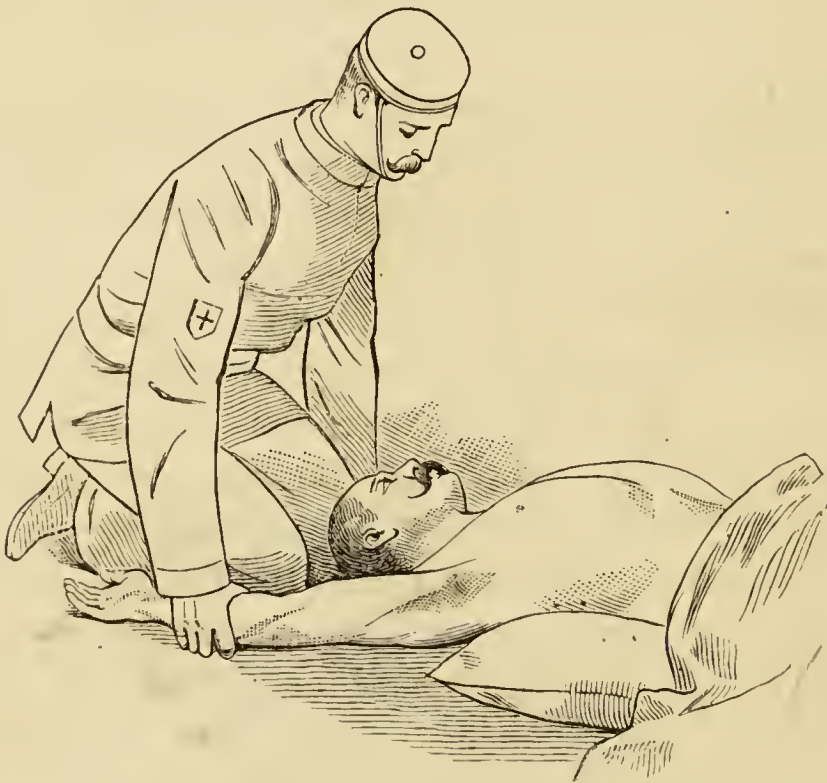


FIG. 25.—SYLVESTER'S method of performing artificial respiration—inspiration.

the directions published by the Royal National Lifeboat Institution.

**Sylvester's Method.**—Place the patient on the back on a flat surface inclined a little upwards from the feet; raise and support the head and shoulders on a firm cushion or folded article of dress placed under the small of the back.

*To Imitate the Movement of Breathing.*—Standing, or kneeling, at the patient's head, grasp the arms just above the elbows, and draw the arms steadily and gently upwards



above the head, and *keep them stretched* upwards for two seconds. (*By this means air is drawn into the lungs*) (Fig. 25). Then turn down the patient's arms, and press them gently and firmly for two seconds against the sides of the chest. (*By this means air is pressed out of the lungs*) (Fig. 26).

Repeat these measures alternately, deliberately, and perseveringly about fifteen times in a minute until a spontaneous effort to respire is perceived, immediately upon which cease to imitate the movements of breathing, and proceed to induce circulation and warmth.

Dr. Sylvester gives another direction which I have pur-

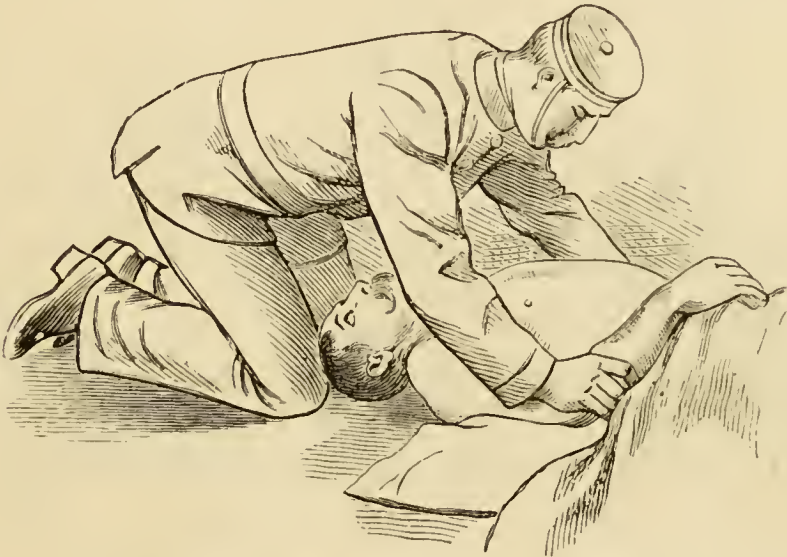


FIG. 26.—SYLVESTER'S method of performing artificial respiration—expiration.

posely omitted, for unless there are two persons engaged in the artificial respiration, or unless, which is unlikely, elastic bands happen to be in their pockets, the direction cannot be carried out: it is this,—Draw forward the patient's tongue and keep it projecting beyond the lips; an elastic band over the tongue and under the chin will answer this purpose, or a piece of string or tape may be tied round them, or, by raising the lower jaw, the teeth may be made to retain the tongue in that position.

If the rolled coat or blanket used as a cushion and placed

under the back (*the lower part of the shoulders and small of the back* is where it should be placed, and not, as directed, to “raise and support the head and shoulders”) be properly managed, there will scarcely be any need to tie forward the tongue, for the head will be thrown well back, the neck stretched in the same direction, and the chest thrown out, these positions, by raising the chin well, will keep the upper part of the windpipe free. But if there is a second bearer, let him draw forward the tongue with a finger and thumb, grasping it with a bit of lint or a handkerchief to keep it from slipping back.

**Marshall Hall's Method.**—Place the patient on the



Fig. 27.—MARSHALL HALL'S method of restoring the apparently drowned.

ground, face downwards, and with one forearm under his forehead for a few seconds.

*To Imitate Breathing.*—Replace the patient on the face, raising and supporting the chest well on a folded coat or other article of dress.

Turn the body very gently on the side and a little beyond, and then briskly on the face, back again, repeating these measures cautiously, efficiently, and perseveringly, about fifteen times in the minute, or once every four or five seconds, occasionally varying the side (Fig. 27).

By placing the patient on the chest, the weight of the

body forces the air out ; when turned on the side, this pressure is removed, and air enters the chest.

On each occasion that the body is replaced on the face, make uniform but efficient pressure with brisk movement on the back between and below the shoulder-blades on each side, removing the pressure immediately before turning the body on the side.

During the whole of the operation let one person solely attend to the movements of the head and of the arm placed under it.

The first measure increases the expiration ; the second commences inspiration.

As soon as the breathing has been restored, strip off the wet clothes and dry the body, wrapping it in blankets, use friction with the hands, always passing them upwards towards the heart ; the rubbing should be conducted under the blanket ; if you can get hot-water bottles, hot bricks, warm flannels, &c., place them to the feet, between the thighs, under the armpits, and the pit of the stomach. When the patient is really breathing, do not be in a hurry to make him swallow restoratives ; it is far better not to agitate him thus, but to wait twenty minutes or half-an-hour, then a small quantity, *one teaspoonful*, of warm milk or tea or coffee may be given, and if swallowed easily, may be repeated till a moderate amount has been taken. A small quantity of alcoholic spirits may be mixed with the warm drink. The patient must be put into a warm bed and allowed to sleep.

These attempts to restore the breathing must be persevered in for some hours.

Of these two methods, Sylvester's is the more easy, Marshall Hall's requiring at least three to carry out efficiently.

**Howard's Method.**—Having placed the patient face downwards, with his chest supported by a rolled blanket, and his head resting on the hand to let the water drain out of his mouth :—

(1.) Press in two or three times, for four or five seconds.



each time, upon the patient's back, so that the water is pressed out of the lungs.

(2.) Quickly turn the patient, face upwards, with a roll of clothing under the back, just below the shoulder blades, and make the head hang back as low as possible. Place the patient's hands above his head. Kneel, with the patient's hips between your knees, and fix your elbows firmly against your hips.

Now, grasping the lower part of the patient's naked chest, squeeze his two sides together, pressing *gradually* forward with all your weight, for about three seconds, until your mouth is nearly over the mouth of patient; then, with a push, *suddenly* jerk yourself back. Rest about three seconds, then begin again, repeating these bellows-blowing movements with perfect regularity, so that foul air may be pressed out, and pure air be drawn into, the lungs about eight or ten times a minute for, at least, one hour, or until patient at least breathes naturally.

. . . be careful not to interrupt the first, short, natural breaths. If they be long apart, carefully continue between them the bellows-blowing movements as before.

**Fits.**—*Fainting fits* (*syncope*) are distinguished by the man sinking down exhausted, insensible, and remaining quiet, without any contortions of the body. The lips and face are white; the body feels cold, and is often covered with a cold sweat.

*Treatment.*—Place the man at once flat on his back, unbutton his coat, unhook his collar, loosen all belts, and give him plenty of air. Let no others crowd around as they all try to do. Sprinkle cold water over his face and neck; apply ammonia and water on a handkerchief under his nose; when he comes to, let him drink a little water and sal volatile (about 30 drops).

*Epileptic fits.*—A sudden fall, with convulsions often most violent,—throwing the arms and legs about, twisting the head to one side, and sometimes frothing at the mouth, are signs of this kind of fit.



*Treatment.*—Place the patient on his back, if possible on a mattress, or, at least, something softer than flag-stones; unloosen all belts and tight clothing. Hold the man down sufficiently to prevent him from injuring himself in his violent convulsions. Let one bearer get behind, kneel down, and hold the head steady, face upwards, and place between the teeth a wisp of a triangular bandage to keep the tongue from being bitten. Let two others, one on each side, grasp each a knee-joint with one hand, and an elbow-joint with the other. Or, if four others can be found, let two grasp the ankles and knees, and two the wrists and shoulders.

*Apoplectic fits.*—The man falls suddenly, unconscious, usually red in the face, and breathes in a puffing and snorting manner.

*Treatment.*—Loosen all tight clothing, *raise* the head and shoulders, putting a rolled coat under, damp the head with cold water, give him air, and—do nothing more.

*Sunstroke*, it is almost needless to say, occurs only in sultry weather. The man falls suddenly, the face frequently much flushed, and there may be convulsions; the head and neck are exceedingly hot to the touch.

*Treatment.*—Carry at once into the shade; loosen all tight clothing; raise the head and shoulders; dash cold water over head, face, and chest; fan him if there is no air; put ice to the head if procurable.

*Drunken fits.*—There is almost invariably a foul smell of spirits or beer about the man's breath. The man lies like a log, the face is often flushed, and breathing is heavy and laboured. Loosen all tight clothing, and place the man on his right side, propping him up in that position by some means or other; do not let him roll over either on his back or face. If he can be roused to swallow, make him drink some warm water.

**Poisoning.**—It is by no means an easy manner always to find out what has been swallowed. The sufferer may afford the information, or you may have to hunt about for bottles,

packets, or papers lying near. Carbolic acid you can detect, as the smell hangs about a bottle recently containing it; laudanum also. A table of the usual poisons, with their respective antidotes, will be found in the appendix. It is impossible in an elementary lesson to go very deeply into the subject of poisons. It will be sufficient if you learn that there are different classes of poisons, and the general rules for the First Aid necessary in each class.

We divide poisons into (*A*) Irritants, and (*B*) Narcotics.

**Irritant Poisons** are those which, when gaining an entrance into the mouth, gullet, and stomach, produce irritation, or are so strong as to burn and partially or wholly corrode and destroy the tissues with which they come into contact. The most common of these are, spirits of salts, oil of vitriol (sulphuric acid), nitric acid and carbolic acid, Spanish fly (cantharides), strong alkalies (ammonia, potash liquor, soda), oxalic acid and phosphorus.

**Narcotic (stupor producing) Poisons.**—These are such as laudanum, morphia, belladonna, chloral, henbane, prussic acid, and strychnine (affecting the nervous system directly).

In the case of irritant poisons, there is intense pain in the regions of the chest and stomach, the red membrane of the lips and mouth appear whitened, and there may be burning and staining of the skin and clothing. The breathing is much shortened on account of the pain in moving the abdomen.

*Treatment.*—Give the man some oil to drink, chalk and water, magnesia and water, soapsuds, milk, raw eggs beaten up, flour and water. Do not give the patient anything to make him vomit, as by the violent movements of sickness you increase the irritation or damage already done internally, unless you have ascertained that *phosphorus* has been swallowed, then give two teaspoonfuls of mustard, mixed in large drinks of warm water, to induce vomiting.

In narcotic poisoning the broad indications are—(*a*) To empty the man's stomach; (*b*) To keep him awake. He is

drowsy and limp ; his skin is cold and damp. Examine his eye, and the pupil (in laudanum poisoning) will be found narrowed into a very small circle (in belladonna poisoning, on the other hand, the pupils are much enlarged, so that the eyes look all pupil).

*Treatment.—Emetics.*—Give him warm mustard and water, or a tablespoonful of common table salt in a tumblerful of warm water, or, if these fail, open his mouth and tickle the back of his throat with a feather. After he has vomited, make him drink plenty of strong coffee ; make him walk about, or, rather, walk him about (it takes two or three to do this) ; never let him sleep ; shout at him ; keep him awake or on the move ; make him sniff smelling salts. If you let him get off to sleep, he will never wake again. If all your efforts fail in arousing him, you must practise artificial respiration.

**Coal Gas Poisoning.**—Remove the sufferer into the open air, and at once practise artificial respiration.

## LESSON X.

### STRETCHER CARRYING—LIFTING AND LOWERING WOUNDED —IMPROVISED MEANS OF TRANSPORT.

STRESS has been laid in previous lessons upon the necessity for handling fractured bones with the utmost care, and for the subsequent lifting of sufferers from such accidents.

It will be necessary now more fully to enter into this question, inasmuch as the proper carriage of stretchers laden with the injured forms a most important part of ambulance duty.

Four bearers form a stretcher detachment; two to bear the patient, the second two to relieve the others when fatigued or disabled, to carry the patient's arms and accoutrements if necessary, to watch the injured man closely, and to help the first two bearers in adjusting the stretcher or lifting it over obstacles.

The following instructions to bearers, and general rules for stretcher carrying, are those drawn up by Surgeon-General Sir Thomas Longmore, Professor of Military Surgery at Netley, for the training of the Medical Staff Corps.

**To March with Stretchers.**—The main purposes to be kept in view, in marching with a stretcher, are as follows:—**First**, the mode of progression of the bearers should be so regulated as to avoid any impulses being thereby communicated to the stretcher. This can be best accomplished by the *broken step*, a short pace not exceeding twenty inches, allowing no springing from the fore part of the foot, and by keeping the knees well bent while the advance is being



made ; and, **Secondly**, the stretcher must be maintained, on all occasions, in the horizontal position, or in a position as near to the horizontal as possible—the inclination downwards, in the latter case, being towards the feet of the patient, so as to ensure the greatest amount of safety to the person who is being carried upon it. Men of the same height are therefore selected to act together as bearers ; and on sloping ground, the general rule<sup>1</sup> for the bearers is to carry the foot end of stretcher foremost down-hill, but the the head end foremost up-hill.

The *broken step* will require much practice and frequent repetition before the proper carriage of wounded men on stretchers can be secured.

**General Rules for the Proper Carriage of Stretchers :—**

1. When braces or shoulder straps are used to assist the bearers in carrying stretchers, care should be taken, at starting, that they are buckled so that the parts supporting the poles are all at equal distances from the *surface of the ground*.

2. As most ground over which wounded have to be carried is likely to present irregularities of surface, it becomes an important matter for bearers to practise the carriage of stretchers, so as to acquire a facility of keeping the stretcher level, notwithstanding the ground is uneven. Bearers trained and habituated to this duty perform it with ease and dexterity, irrespective of differences in their own respective heights ; while those who have not practised it are, in consequence of their deficient training, not unlikely to cause considerable distress to the person carried, when they have to carry him up and down hill.

A concerted action of the front and rear bearers is necessary, and each must be aware of what part he is to perform, according as the end of the stretcher at which he is placed

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<sup>1</sup> *N.B.*—Important exception to this rule is—the reverse position should be assumed, both as regards going up hill and going down hill, in case the patient being carried is suffering from a recent fracture of the thigh or leg.

is rendered higher or lower by the unevenness of the surface over which they are passing.

The art can readily be acquired by practising the carriage of the stretcher up and down steps.

In this practice the front and rear bearers should occasionally change their respective positions. A bearer should also be carried on the stretcher in turn, so as to be made practically aware of the effects of even and uneven carriage.

3. If the ground over which the conveyance has to pass presents a general ascent, and the bearers are of different heights, then the rear, or No. 3 bearer, should be the taller and stronger man, for his greater height and the greater strength of his arm will be useful in supporting and raising the stretcher up to the level of the end carried by the foremost man. The weight of the stretcher will naturally be thrown in the direction of the man on the lower level.

4. If the ground presents a general descent, the front, or No. 1 bearer, should be the taller and stronger, for the same reasons as those just given as regards the No. 3 bearer under the opposite circumstances mentioned in Rule 3.

5. A sick or wounded person on a stretcher should be carried, if the ground be tolerably level, with his face looking towards the direction in which the bearers walk.

The front, or No. 1 bearer, then supports the end of the stretcher at which the patient's feet are placed; the bearer near the patient's head is the rear bearer.

6. If the bearers have to carry the stretcher up hill, the front bearer should support the end of the stretcher on which the patient's head is placed, excepting in the case (fractured thigh or leg) mentioned under Rule 7.

7. If the bearers have to carry the stretcher down hill, the rear, or No. 3 bearer, should support the end on which the patient's head is placed. The reverse position should be assumed by the bearers, both as regards going up hill and going down hill, in case the patient being carried is suffering from a recent fracture of the thigh or leg.

The patient's comfort and welfare will be best consulted, as a general principle, by the arrangements named in Rules 6 and 7. Although, under all circumstances, the level position should be sought for as much as possible, still, if the slope of the ground be such that it cannot be attained, it appears desirable that the inclination downwards should be towards the feet rather than towards the head of the patient. But with regard to the exception named, the reverse position of the patient is directed, in order to prevent the weight of his body pushing the upper end of the broken bone down upon the helpless and motionless portion of the limb below the seat of fracture.

8. No attempt must be made to carry a helpless patient over a high fence or wall if it can possibly be avoided ; it is always a dangerous proceeding. The danger is, of course, increased in proportion to the height of the wall or fence. But even if the wall be not much higher than one over which the bearers can step, the stretcher must be made to rest upon it, to the inconvenience, and probable pain, of the patient while each bearer in succession gets over the obstruction ; and it is better to avoid even this inconvenience, provided the avoidance does not entail great delay. If the fence or wall be high, either a portion of the wall should be thrown down or a breach in the fence made, so that the patient may be carried through on the stretcher ; or, if this be not readily practicable, the patient should be carried to a place where a gate or opening does already exist, notwithstanding the distance to be traversed may be increased by this proceeding. It is better that the transportation should be somewhat delayed than the safety of the patient's limbs or life risked.

9. In crossing a ditch, dyke, or hollow, the stretcher should be first laid on the ground near its edge ; Nos. 1 and 2 then descend. The stretcher, with the patient upon it, is afterwards advanced. Nos. 1 and 2 in the ditch supporting the front end of the stretcher, while its other end rests on



the edge of the ground above. While thus supported, Nos. 3 and 4 descend. All the Nos. now carry the stretcher to the opposite side, and the fore part now being made to rest on the edge of the ground while the rear part is supported by Nos. 3 and 4 in the ditch, the Nos. 1 and 2 are left free to climb up. The stretcher is now pushed or lifted forward on the ground above, and rests there while Nos. 3 and 4 climb up. The bearers then carry the stretcher on.

10. On no account should a stretcher be permitted to be carried on the shoulders of two or four bearers. The evil of such a proceeding is not only that it is difficult to find several bearers of precisely the same height, so that a level position may be secured, but also that the wounded or sick person, if he should happen to fall from such a height owing to the helpless condition in which such a patient usually is, is not unlikely to sustain a serious aggravation of the injuries he may already be suffering from. Moreover, one of the bearers of a stretcher ought always to have his patient in view, so as to be aware of hæmorrhage, fainting, or other change requiring attention, taking place, and this cannot be done when the patient is carried on the shoulders. The height, too, is calculated to cause the patient uneasiness and fear of falling off, which it is also desirable to avoid. For all these reasons, notwithstanding that bearers will often attempt to carry a patient on a stretcher upon their shoulders, from the weight being borne more easily in that position, or with a view of relieving a fatigued condition of the arms, the practice should be strictly forbidden.

Upon the above code of rules is founded the present stretcher exercise, in which, by this time, you should have acquired some proficiency.

**Loading and Unloading Stretchers.**—The words of command in this exercise are, of course, for instructional purposes only at drill, and to habituate bearers to act in



concert and upon some systematised plan. The placing of the prepared stretcher (when there are four bearers) will always be *parallel* to the body of the injured man, and should be on the sound, not the injured side of the patient, and about four feet distant from him.

The following rules should be observed when about to render First Aid to a wounded or injured man on the field,—

1. If the injury is found to be one to the lower extremities, if of the right thigh or leg, place the prepared stretcher four feet away parallel to the patient on the left. If the injury be to the left thigh or leg, place the stretcher on the right of him.

2. In unfastening his belts, and unloosening tight clothing, and in ripping up the outer trousers seam, do not attempt to commence operations until two bearers have taken charge of the fractured or wounded limb to hold it steady.

3. In taking the man's rifle, either to use as a splint or collecting it amongst his other belongings to carry away, examine it to see if it is loaded, and if so, at once remove the cartridge.

4. Hæmorrhage is the first complication to be attended to ; apply a graduated compress and bandage, or, if necessary, a tourniquet, above the wound on the main artery if the bleeding appears to be arterial. A pad and bandage for venous or capillary hæmorrhage. As soon as bleeding has been controlled, apply your improvised or other splints if required.

5. Take especial notice of the nature and situation of the injuries, for you will have to place the man upon the stretcher with due regard to them as follows,—

In wounds of the head, see that the canvas of the stretcher does not press upon the wound, but arrange a rolled coat as a pillow, so that the sound side of the head and face may be downwards, and that the chin is not bent forwards on the chest.

In fractures and wounds of the thigh or leg, lay the man upon his back but inclining a little towards the injured side, as the injured limb will be less disturbed in this position.

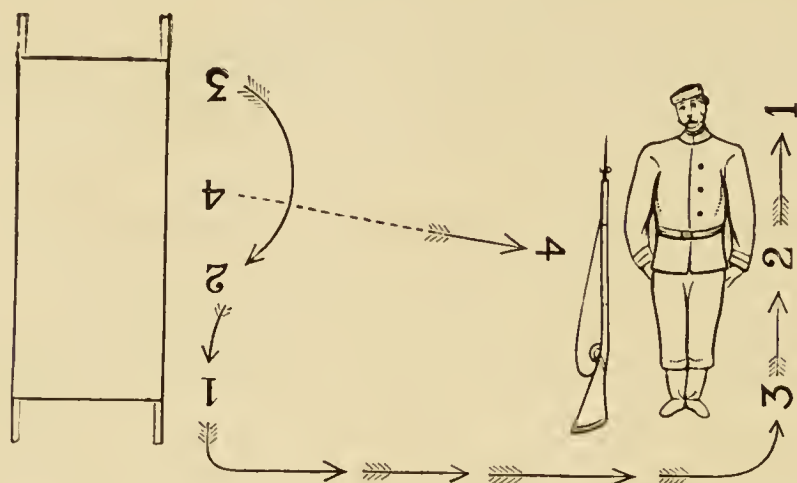


FIG. 28.—Bearers' position in lifting wounded. The stretcher placed at the right side of wounded, showing position of Nos. 4 and 1, 2 and 3 before lifting.

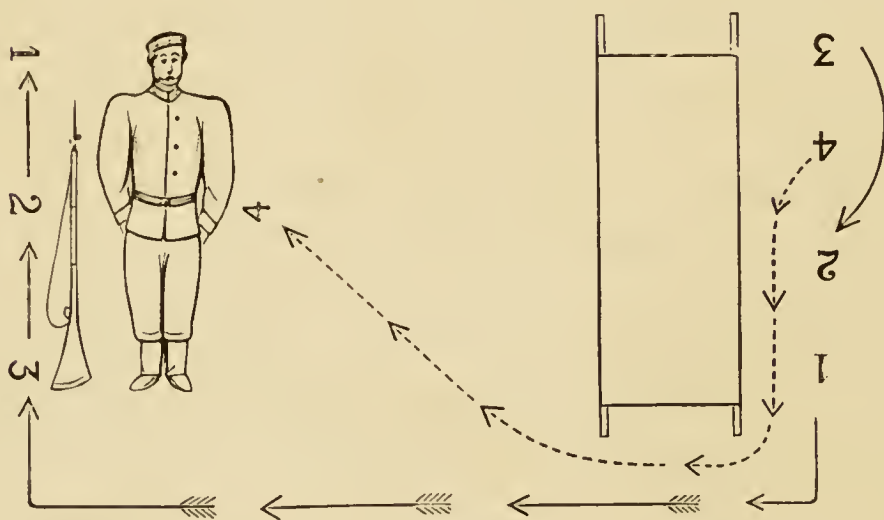


FIG. 29.—Bearers' position in lifting wounded. The stretcher placed at the left side of wounded, showing position of Nos. 4 and 1, 2 and 3 before lifting.

To effect this, devise some slight support to be placed under the patient's back *on the sound side only*—a pouch or two, or belts folded lengthwise upon themselves will answer, and additional immobility may be obtained by fastening both

limbs together by encircling them with one or two triangular bandages.

In wounds and fractures of the upper extremity (a compound fracture of the humerus should not be allowed to walk), if it be necessary to carry the patient, place him lying down on his back or on the *sound* side ; so that the injured limb may not come into contact with any part of the stretcher.

In chest wounds, arrange supports so as to raise the head and shoulders, as this eases the breathing, and incline the body towards the *injured* side.

In abdominal wounds, lay the patient on the injured side with supports under the knees to draw the legs up, thus relaxing the front of the abdomen. If the wound is in the front of the abdomen, place the man on his back with the head and shoulders raised, and the knees well raised to relax the abdominal muscles.

6. If Nos. 1 and 3 are carrying, Nos. 2 and 4 are responsible for the safety of the patient as he lies on the stretcher, and are to keep him under close observation ; marching one on either side of him, administering water to drink, and readjusting great-coats, valises, &c. &c., and other means of support, and keeping a particular watch that a tourniquet does not slip out of place, halting the stretcher at once if any interference is necessary, on no account attempting to readjust anything whilst Nos. 1 and 3 are moving.

**Lifting and Lowering Wounded.**—The words of command for this exercise are—

“ *Take post at the right (or left) of the wounded.*”

“ *Advance.*” “ *Lower stretchers.*”

“ *Prepare stretchers.*”

“ For Loading { *Lift wounded.*  
“ *Lower wounded.*”

“ *Lift stretchers.*” “ *Advance.*” “ *Halt.*” “ *Lower stretchers.*”

“ For unloading { *Lift wounded.*  
“ *Lower wounded.*”

To place a patient on a stretcher involves three separate operations, viz.:—

- a.* The patient must be lifted off the ground by *the four bearers* of the detachment.
- b.* The stretcher must then be laid on the ground immediately under him by one of the bearers (No. 4.)
- c.* And the patient must then be lowered on the stretcher by three of the bearers (Nos. 1, 2, and 3), assisted by the fourth.

In lifting (*a*) all four bearers take part. No. 1 passes his right hand and arm under the neck and chest, and his left hand and arm across front of chest and under right armpit, hands taking a secure hold of the opposite side, and making a cradle of his arms.

No. 2 passes his under the patient's hips and small of the back or loins; No. 4, from the opposite side, doing the same, each (2 and 4) gripping the side of the body furthest from him securely with the hands.

No. 3 passes both hands and arms under the lower limbs, but—if there is a fracture—passing one arm and hand over, and one under, the limbs for the support of the fracture.

To apply the requisite dressings and splints, and to attend generally to the wants of the injured man, the bearers on arrival at his sides will invariably kneel down, kneeling on the left if the stretcher is placed on the right side, on the right if placed on the left side of the patient. The lifting will still be done kneeling. Acting together by such words of warning as "Ready?" "Yes." Three (lift), the four bearers will slowly, and with the least amount of movement possible; (*b*) lift the man about 2 feet off the ground, using the knees off the ground as a means of support, and steady him in that position—keeping the lifted body perfectly stiff and horizontal. No. 4, after warning the others, removes his arms and hands from under, rises, doubles



round by the head of the stretcher to the opposite side, and seizing the middle of the pole farthest from the patient with the left hand, and the other pole with his right, lifts the stretcher and advances, carrying it parallel to the group of bearers and wounded, and placing it directly under the patient, close up to the bearers' feet. Having done this without knocking the side pole of the stretcher against the shins of Nos. 1, 2, and 3, a proceeding very likely to cause them to let the injured man roll out of their arms, he again assists them in supporting him.

At the words "Lower wounded," given by No. 4, if acting in independent detachments, the four bearers (*c*) lower the injured man slowly, and place him on the centre of the canvas, releasing their arms and hands from under with as little disturbance as possible.

After arranging belts, pouches, greatcoat, &c., as supports, at the word "Two," following the last command, "Lower wounded," the bearers stand to stretchers by the shortest road.

*Lifting with Three Bearers.*—Place the stretcher at the patient's head, not crosswise, but in a direct line with his body. To lift, No. 1 will place himself opposite No. 3, by the patient's loins; No. 2 at one side, by the knees; all kneeling. Nos. 1 and 3 pass an arm each under patient's back and under his thighs, near the buttocks, locking the fingers of both hands underneath. No. 2 must do his best with the lower limbs, passing his arms under, and steadying them by turning his hands and fingers in an upward direction. Rising by word from No. 2, they will stand up erect, and by a short *broken* side step will carry the man head foremost over the foot of the stretcher.

*Lifting by Two Bearers.*—Place the stretcher at the patient's head, in direct line with his body. (*a*) In case of injury to the lower limbs, both bearers place themselves on the injured side; the one opposite patient's knees must raise and support the lower limbs, the one opposite the hips

the body, assisted by the patient, who passes his arms around the neck of the bearer. Rising together from the kneeling posture, keeping the injured man as horizontal as possible, they carry the patient head foremost over the foot of the stretcher, and lower steadily.

(In unloading by this method, and also in the last, the patient will be carried head foremost over the head of the stretcher.)

As stated before, on no account should a fracture of the lower extremity be lifted by two men only if it can possibly be avoided; three bearers, but better four, should lift in such a case.

Every movement of a wounded man should be conducted with the utmost care and gentleness to minimise pain and prevent further damage to a wounded part. Gentleness in rendering first assistance, steadiness in lifting and lowering upon the stretcher, and the utmost care in transport are essential.

Great torture is inflicted upon a wounded man by careless or ignorant carriage. Any jolting or oscillation of the stretcher may unset a fracture and re-induce bleeding, or may roll the man off on to the ground.

Perfect unity of action on the part of bearers carrying a laden stretcher is the thing to be aimed at, No. 1 never acting without warning to No. 3, and *vice versa*. Although for drill purposes the word "March" is given, nothing in the faintest degree resembling a march off is to be attempted. No. 1 will step off with the left foot, No. 3 with the right, purposely breaking step to prevent jolting and rocking the stretcher. A short step of about 20 inches will be taken, the knees kept bent, and the hips stiff, the feet planted firm and square at each step, avoiding springing with the toes as in ordinary walking. For the same reasons anything like the sudden check of a military halt is inadmissible; Nos. 1 and 3 bringing up very easily and slowly when requiring to stop, and No. 3 warning No. 1, or the reverse.

**Unloading Stretchers.**—For unloading, “Lift wounded,” “Lower wounded.”—On this order, Nos. 1, 2, and 3 turn to the right, facing the stretcher, and No. 4 turns outwards, and moves round the head of the stretcher to its centre on the opposite side. As soon as No. 4 moves outwards No. 3 places himself opposite the patient’s shoulders, No. 2 opposite the hips, No. 1 opposite the legs.

At “Two” all kneel down and proceed as before described, to take hold of the patient.

At “Three” he is raised and steadied as before. No. 4 will take hold of the centre of the poles, lift the stretcher off the ground, and whilst stooping down will move it two paces to his rear; then, passing round the head of the stretcher, assists Nos. 1, 2, and 3 to lower the patient.

“Lower wounded.”—The patient will be lowered, and the bearers stand up.

The “dummy” wounded will then be ordered to “rise,” and will be marched to the front.

As soon as the patients are clear of the detachment, the men will stand to stretchers and front together.



## LESSON X.—*Continued.*

### IMPROVISED TRANSPORT—HAND-SEAT DRILL.

WHEN no stretchers are available it will be necessary to improvise them, and, except in injuries to the lower extremities and others equally severe, a means of transport by



FIGS. 30 and 31.—Assisting a wounded man to walk.

two, three, and four-handed seats will be employed, and if the wounded man is able to walk with assistance he may be materially helped to the rear by the following method.



**Assistance by one Bearer.**—Let the patient pass one arm round the bearer's neck letting his wrist and hand hang down in front of the bearer's opposite shoulder. The bearer then places his near arm diagonally across the patient's back grasping the opposite hip with the hand, while with his other hand he holds the patient's hand hanging over his

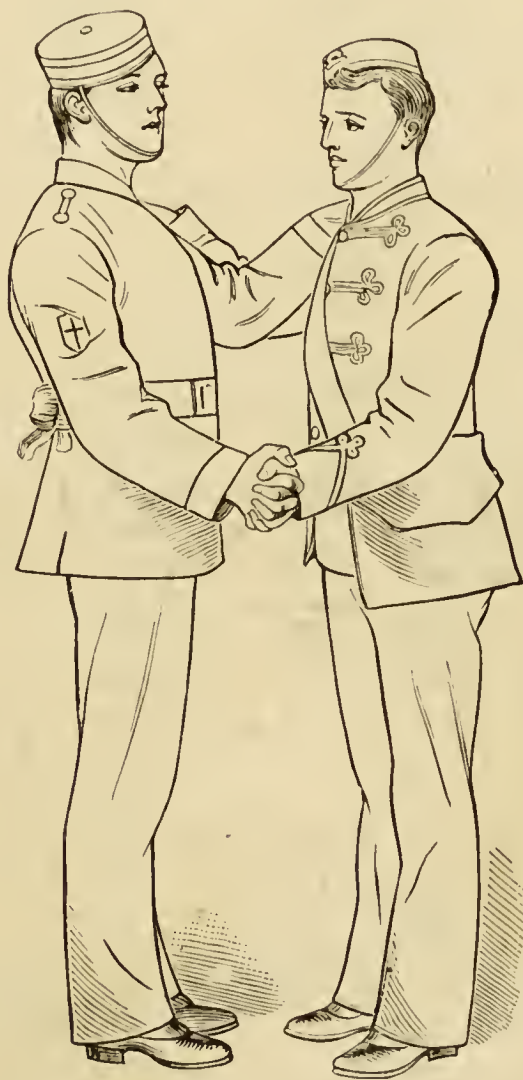


FIG. 32.—The two-handed seat.

own shoulder. The bearer must come close up to the patient, so that the front of his own hip and thigh shall touch the side and back of the patient's hip and thigh and in moving forward throw his own hip against that of the patient thus supporting, and partly lifting him onward at every step (Figs. 30 and 31.)

**Carriage by two Bearers, the two-handed seat** (Fig. 32).—Two bearers face one another, locking the fingers of the left hand of one, with the right hand fingers of the other. The support thus formed is passed beneath the patient's thighs in front of the buttocks for a seat, at the same time their

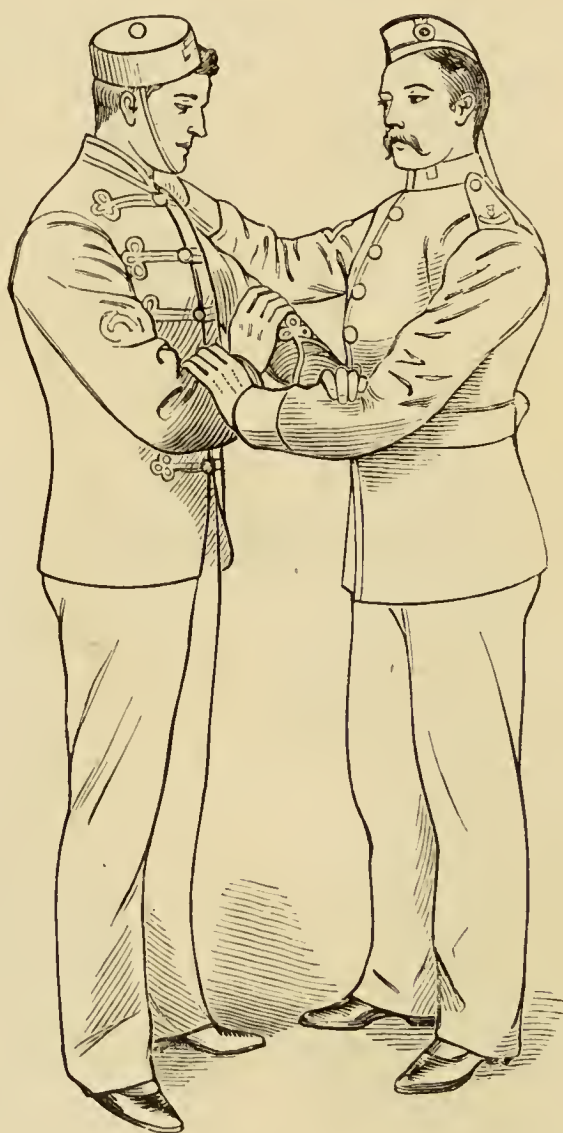


FIG. 33.—The three-handed seat.

disengaged hands rest upon and grasp each other's shoulders behind the patient, their arms thus forming a back support. If the patient is able to use his arms, the bearers need not grasp each other's shoulders, but may pass their disengaged arms round the patient's loins, the man carried passing each of his arms round the neck of each bearer.

*The three-handed seat* (Fig. 33).—To simplify the directions for forming seats it will be better to number the bearers. Let Nos. 1 and 3 face each other as in the last method. No. 1 grasps the thick part of his own left forearm, just below the elbow with his right hand, and with his left hand the left forearm of No. 3. No. 3 with his left hand grasps the right forearm of No. 1 at about its middle,—this arrangement of three forearms and three hands forms a triangular seat.

To form the back No. 3 grasps the left shoulder of No. 1 with his right hand.

*The four-handed seat* (Fig. 34).—Nos 1 and 3 face each



FIG. 34.—The four-handed seat.

other, both bearers grasp their own left forearms with their own right hands at about the wrist. With the left hand No. 1 grasps the right forearm of No. 3; and No. 3 with his left hand grasps the right forearm of No. 1.

As a substitute for the seats with hands chairs may easily be improvised with a couple of long swords and a coat. The swords (in their scabbards) should be passed through the sleeves which have previously been turned outside in, and the coat skirts buttoned from below upwards for two or three buttons over the sleeves encasing the swords. To form a traverse and back rest, a stick of wood or an



entrenching tool can be lashed across with a string or two triangular bandages just below the sword hilts. The patient can sit in this chair hammock easily and be carried as if in a sedan chair.

If he can sit up and pass his arms around two bearers' necks, they can form a seat with two rifles, round which a coat has been rolled and strapped at the middle carrying the rifles horizontally between them.

*Improvised stretchers* can be made out of hurdles, shutters, or planks ; in the two latter cases straps, ropes, or wooden traverses must be passed underneath between two bearers at the head and two at the feet.

**The Rifle stretcher** is formed with a blanket or rug, and two rifles laid on the ground at each side and folded over them.

To be of use, the bayonets (sheathed) should be left fixed, as without this the stretcher formed is too short to be of practical utility.

To make this stretcher, four bearers face inwards, No. 1 opposite No. 2, No. 3 covers No. 4. Two paces interval between Nos. 1 and 3, and between 2 and 4. The blanket is spread out on the ground between the four ; should it be oblong the shorter sides must point front and rear. Two rifles with sheathed bayonets fixed are now laid upon the rug, ten inches from its centre line, butts to the rear, trigger-guards outwards, a fold of the rug six inches wide is first turned over the butts, at the head end, next the right side of the blanket over the right rifle, last the left side of the blanket over the left rifle, thus having three folds of blankets, twenty inches wide.

In lifting this form of stretcher very great care is required, both on account of the patient's safety and also to avoid straining the rifles.

Nos. 2 and 4 will be on the left of the stretcher, 3 and 1 on the right. Nos. 2 and 3 will grasp the ends of the rifles with their left hands (No. 2 the muzzle, No. 3 the butt of the



opposite rifles) and the centre of the rifles with their right.

Nos. 1 and 4 grasp the ends with their right, and the centres with their left hands. Their hands at the centres of the line of rifle barrels should almost touch, and a very firm grip taken at every point to prevent the blanket slipping, as it is very prone to do when carrying a man in it.

For the two rifles, of course, may be substituted lances and poles long and strong enough, gun-sponges and rammers; rake handles, pitchforks and other farm implements come in very usefully, and a large sack, provided the rifles or poles are passed inside and out at two holes made at the foot of the sack, forms a good substitute for the blanket. Two greatcoats will also make a stretcher bed, but the sleeves should be pulled outside in first, and the coats buttoned all the way up the front over the sleeves and rifles passed through them.

**Rifle Stretcher Exercise.**—For this drill, rifles, with bayonets sheathed and fixed, are served out to Nos. 1 and 4 of each stretcher detachment, and a rolled rug to every No. 2.

The company or section is first formed up in front and rear rank, after distributing rugs and rifles; fours deep are next formed, and the several ranks told off as in the ordinary stretcher exercise.

The words of command are few, but involve many actions, and are—

“Prepare rifle stretchers.” “Lift arms and rugs.”

(a). *Prepare Rifle Stretchers.*—All the numbers of each detachment face to the right, having previously been extended at four paces interval.

Nos. 2 and 4 remain steady, but Nos. 1 and 3 take two paces to their then front, halt, and turn to the right-about; as soon as Nos. 2 and 4 see this, they each close outwards one pace so as to face Nos. 1 and 3.

No. 2 takes the rug off his shoulder, unbuckles the strap,

and throws one end of the roll to No. 3, and with the help of No. 3 spreads out the rug lengthwise between the four men. Nos. 1 and 4, as soon as the rug is ready, stoop down and lay their rifles on the rug, as above described—rifle-butts to the rear.

They then stand to stretchers thus:—Nos. 2, 3, and 4 turn to the left, No. 1 to the right. No. 1 then wheels to the left-about, to his place on the left of the foot of the stretcher (the bayonet end), halts, and fronts. No. 3 wheels to the right-about, round by the head of the stretcher, to his place. No. 2 steps back and No. 4 steps forward one pace.

(b). *Lift Arms and Rugs*.—No. 1 wheels to the right, past the foot (bayonets) of the stretcher to the opposite side; No. 3 wheels to the left-about, to the opposite side, by the rifles' butts; 2 and 4 turn to the right, and close outwards

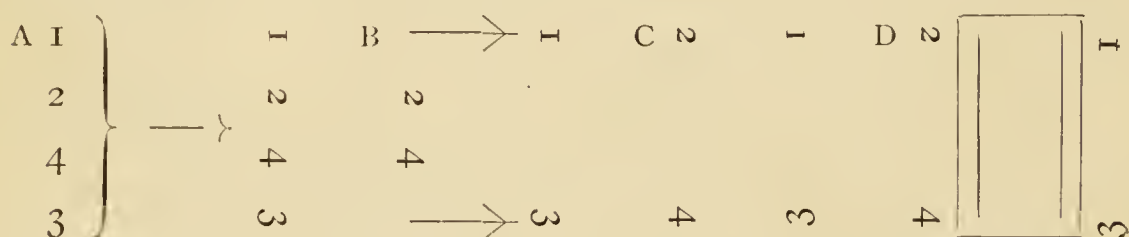


FIG. 35.—Bearers' positions in rifle stretcher exercise.

to face Nos. 1 and 3, Nos. 1 and 3 facing inwards at the same time. All four kneel down on the left knee, and unfold the rug. Nos. 1 and 4 take up the rifles; Nos. 2 and 3 roll up and strap the rug; all four stand up.

To reform detachment—Nos. 2 and 4 take two side paces inwards; Nos. 1 and 3 two paces to their then front; upon which the whole four front together.

## HAND SEAT DRILL.

[The company will be drawn up in two ranks.]

“From the Right (or from the Left, Centre, or No.—Squad), to Four Paces Extend.”

[As in Stretcher Drill.]

“Form Two-handed Seats.” “Two.” “Front.”

*Form Two-handed Seats.*—Each rear rank man takes a side pace to his left, and two to his front, aligning himself on the left of the front rank man, and both turn inwards together.

*Two.*—The rear rank man locks his left fingers with the right fingers of the front rank man, palms of hands uppermost, and both place the disengaged hand upon each other's hips (or shoulders) (Fig. 32).

*Front.*—The front and rear rank men disengage and turn to the front, the rear rank man taking two paces to the rear and a side pace to the right, again covering his front rank man.

“Form Three-handed Seats.” “Two.” “Front.”

*Form Three-handed Seats.*—As in two-handed seats.

*Two.*—The front rank man grasps his own left forearm, the rear rank man grasps the right forearm of the front rank man with his left hand, and the front rank man the left forearm of the rear rank man with his left hand, the rear rank man placing his right hand on the left shoulder of the front rank man (Fig. 33).

*Front.*—As before described.

“Form Four-handed Seats.” “Two.” “Front.”

*Form Four-handed Seats.*—As in two-handed seats.

*Two.*—Both bearers grasp their own left wrists with their right hands, and each other's right wrists with their left hands, backs of the hands uppermost (Fig. 34).

*Front.*—As before described.

#### (24.) LIFTING, LOWERING, AND CARRYING WOUNDED BY HAND SEATS.

A party of patients will be extended to four paces, marched ten paces in front of the company, and directed to stand

when the exercise is in three or four-handed seats, and to sit on the ground for two-handed seat practice.

### BY TWO-HANDED SEATS.

“Take Post at the Wounded—Advance.”

“By Two-Handed Seats—Lift Wounded.” “Two.”

“Advance.” “Retire.” “Halt.”

“Lower Wounded.”

“Files, Retire.”

*Take Post at the Wounded, Advance.*—Each file steps off towards its corresponding patient, and when immediately in rear of him the front rank man goes to the right, and the rear rank man to the left, halting when in line with and close to the patient.

*By Two-handed Seats, Lift Wounded.*—The bearers turn inwards, kneel on the knee nearest the patient's feet, and form the two-handed seat beneath his thighs, grasping the patient round the loins with the disengaged hand and arm. The patient will be directed to pass an arm round the neck of each bearer.

*Two.*—The bearers rise steadily together, lifting the patient off the ground.

*Advance.*—The bearers step off, the front rank with the right, the rear rank with the left foot, marching by a side step in which the feet are alternately crossed, one before the other.

*Retire.*—The front rank man marks time and brings the rear rank man round, both moving on when square.

*Halt.*—As usual.

*Lower Wounded.*—The bearers kneel, and gently place the patient in a sitting posture on the ground, and stand up, still facing inwards.

*Files Retire.*—The files turn to the rear and march to their places, rear rank leading, halt, and front, without further word of command.



## BY THREE-HANDED SEATS.

“Take Post at the Wounded—Advance.”

“By Three-handed Seats—Lift Wounded.” “Two.”

“Advance.” “Retire.” “Halt.”

“Lower Wounded.”

“Files, Retire.”

*Take Post at the Wounded, Advance.*—As in two-handed seats.

*By Three-handed Seats, Lift Wounded.*—The bearers turn inwards, form the three-handed seat, and, stooping, place it beneath the hips of the patient, who will be directed to pass an arm round the neck of each bearer.

*Two.*—As in two-handed seats, before described.

*Advance.—Retire.—Halt.*—As in two-handed seats.

*Lower Wounded.*—The bearers stoop, instead of kneeling, and the patient stands up.

*Files Retire.*—As in two-handed seats.

## BY FOUR-HANDED SEATS.

“Take Post at the Wounded—Advance.”

[As in two-handed seats.]

“By Four-handed Seats—Lift Wounded.

The bearers turn inwards, form the four-handed seat, and, stooping, place it beneath the hips of the patient, who will be directed to pass an arm round the neck of each bearer.

*Two.*—As in two-handed seats.

“Advance.” “Retire.” “Halt.”

“Lower Wounded.”

“Files, Retire.”

[As in two-handed seats.]

# LESSON XI.

## STRETCHER DRILL.

IN the following, the word “company” may be taken to mean “section” where only sufficient bearers to form the latter are present.

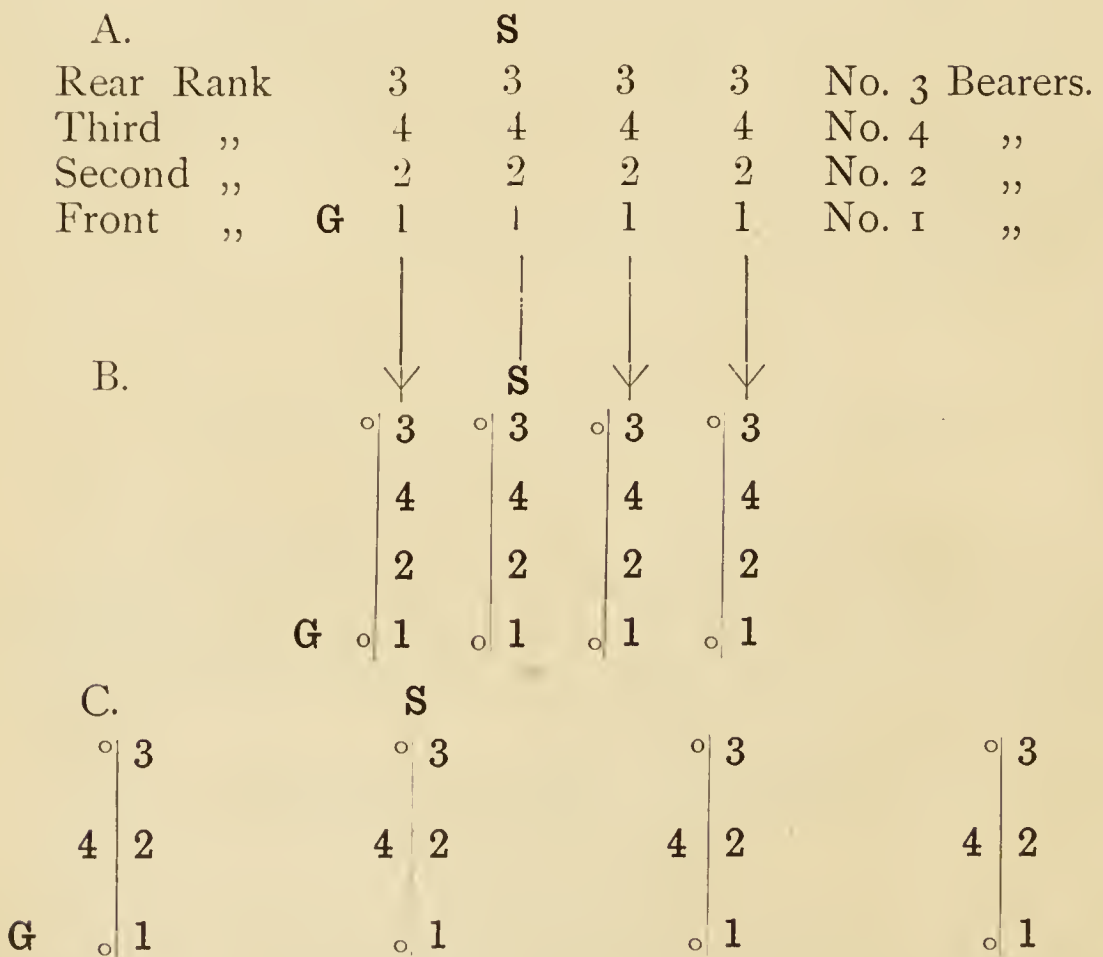


FIG. 36.—A and B.—First formation of a section for the stretcher exercise. B.—Close order. C.—Extended order.

Previous to the parade, stretchers will be piled in a heap on the ground.

# STRETCHER DRILL.

## PART I.

### (3.) FORMATION OF A COMPANY FOR STRETCHER DRILL.

[As for Infantry (Ceremonial) Drill.]

Fours will be formed. Each section of fours forms a stretcher squad. Four squads form a stretcher section. Two stretcher sections (eight squads) form a company.

#### *Words of Command.*

“Front Rank, No. 1 Bearers—Stand at ease.”

“Second Rank, No. 2 Bearers—Stand at ease.”

“Third Rank, No. 4 Bearers—Stand at ease.”

“Fourth Rank, No. 3 Bearers—Stand at ease.”

—(Fig. 36, A).

“Company (or Section)—Attention.”

The bearers of each rank will stand at ease when their rank is named; all four ranks coming to attention at this word.

“Number the Squads.”

On the word “squads,” the No. 1 of each squad calls out “No. 1,” “No. 2,” “No. 3,” “No. 4,” &c., &c., in succession, from the right.

[When there is more than one section.]

“No. 4, 8, 16, &c., &c., “Left of Sections.”

On the number being called the Nos. 1 of the named squads raise the left hand level with the elbow. On the word “sections” the hands are dropped smartly to the side.

Section commanders, who will act as guides and markers when required to do so, as in infantry drill, will now be posted.

“Number the Sections.”

On the word “sections” the section commanders number.

“No. 1, 2, &c., Section—Stand at ease.”

The sections will thus be proved.

“Company—Attention.”

“Nos. 3, left turn (or right turn)—File on Stretchers—Quick March.”



The Nos. 3 turn to the flank named. On the word "March" the No. 3 of the flank named will march on, leading the other Nos. 3 to the heap or row of stretchers in rear of the parade. Each No. 3 as he passes them takes up a stretcher, placing it on his right shoulder at the slope, rollers upwards, grasping the stretcher by the lower racks; he then marches on, and will get the word—

"Mark time in Front," from the last No. 3 or from the guide, to allow the Nos. 3 in his rear to pick up and slope their stretchers; then follow the words—"About Turn—Forward—Halt—Front—Lower Stretchers;" the Nos. 3 will file back to their original places, "Front," and place the stretchers (at the words "lower stretchers") on the ground to the right of their respective squads, rollers to the right of the parade.

"Stand to Stretchers."

All the numbers close to their right and touch their stretchers with their right feet, Nos. 1 with the toes in line with the front end of the poles, Nos. 3 with their heels in line with the rear end of the poles (Fig. 36, B).

"Lift Stretchers."

"Right (or left) Dress."

"Eyes Front."

The Nos. 1 and Nos. 3 stoop, grasp both handles with their right hands, and rise together smartly, letting the right arm down to its full extent, "dress," and "eyes front," "eyes front" being given by the No. 1 of the squad on the right (or left).

#### (4.) "LOWER STRETCHERS."

Nos. 1 and 3 stoop together, place the stretchers on the ground, and rise together.

"About Turn—By the Right (or Left)—Quick March—Halt—Front—Stand at Ease—Stand Easy—Remove Knee-caps."

To dismiss: the section or company is marched clear of



the stretchers, as above ; and when they are worn, knee-caps are removed and collected—

“ Company—Attention—Right Turn—Dismiss,” follows as in ordinary Infantry Drill.

## PART II.

### *Exercises with Closed Stretchers.*

#### (5.) ADVANCING OR RETIRING.

“ Lift Stretchers.”

“ The Company will Advance—By the Right (or Left)—Quick March.”

The Company or Section will advance, directed by the guide on the flank named.

“ The Company will Retire—About Turn.”

“ The Company will Advance—About Turn.”

The bearers, in advancing and retiring, will turn about towards the stretchers, the handles being passed from one hand to the other by Nos. 1 and Nos. 3.

#### (6.) CHANGING STRETCHERS.

“ Change Stretchers.”

If advancing, Nos. 1, on the word “ stretchers,” will pass the stretchers from one to the other hand behind them ; the Nos. 3, following the Nos. 1, will pass the stretchers *in front* of them from one hand to the other, Nos. 2 and Nos. 4 moving diagonally to their places. If retiring, Nos. 1 pass the stretchers in front, and Nos. 3 pass them behind, from hand to hand.

#### (7.) CHANGING FRONT.

“ Right (or Left) Form—Quick March.”

On the word “ Form,” the No. 1 of the squad on the flank named turns to the right (or to the left, if “ Left Form”), the other Nos. 1 make a half-right (or half-left) turn, and the Nos. 2, 3, and 4 make a half-left (or half-right) turn.

On the word "March," all, except the No. 1 of the inner flank, step off and move by the shortest line to their places in the new front, halt, and are dressed by the guide on that flank, who will then give, "eyes front."

(8.) CHANGING DIRECTION.

"Right (or Left) Form."

No. 1 of the squad on the right (or left) turns to the right (or left) and marks time, the rest of the Nos. 1 make a half-right (or half-left) turn, the Nos. 2, 4, and 3 bearers make a half-left (or half-right) turn, the whole form on the No. 1 of the flank named, and each marking time, takes up his dressing and looks to his front as he arrives in his place.

When the company, or section, is at the halt, and it is intended to move off on a new front, the commands will be—"On the Move—Right (or Left) Form—Quick March," and "Forward," when the new front is reached.

(9) MOVING TO A FLANK, AND RESUMING THE MARCH  
TO THE FRONT OR REAR.

"The Company will Move to the Right (or Left),  
Nos. 2 (or 4) taking the Stretchers."

"Right (or Left) Turn."

On the word "Stretchers," Nos. 2 (or 4) will take hold of the stretchers, left hand on top and in front, right hand beneath and behind, hands far apart, placing the stretchers on their right shoulders at the slope. At the word "Turn," the company will turn as directed.

This movement is only used when making a quick movement to either flank.

"The Company will Advance—Front Turn."

While marching to a flank with stretchers at the slope, the advance is resumed by the whole turning to the front on the word "Front Turn," Nos. 2 (or 4) bring the

stretchers down from the slope to the trail with both hands, passing the lower ends to the Nos. 1, and the upper ends to Nos. 3.

“The Company will Retire—Change Stretchers.”

“Rear Turn.”

If required to retire while marching to a flank with stretchers at the slope, the word “Change Stretchers” will be given after the caution, “The Company will Retire,” and before the final word, “Rear Turn.”

At “Change Stretchers,” Nos. 2 (or 4) will change stretchers over their heads from right shoulders to left; at the word “Turn,” all will turn to the rear, after which Nos. 2 (or 4) will immediately lift the stretchers down from their left shoulders to the trail, passing the lower ends to Nos. 3 and the upper ends to Nos. 1, Nos. 3 and Nos. 1 grasping the stretcher handles with their left hands.

Before the “Halt,” if the word “The Company will Advance—About Turn” is now given, the bearers, in turning to the front, will change into their proper positions, with stretchers to the right of them.

In this formation, close order, the section will be practised in advancing and retiring. From the limited space, less than 8 ft., in which the four bearers stand in this formation, these otherwise simple movements present some difficulties. To afford the Nos. 2 and 4 more freedom of movement in marching, Nos. 1 should hold the stretcher somewhat behind, and Nos. 3 somewhat in front of them, Nos. 2, 4, and 3 being at the same time careful to take short steps, and avoid treading on the heels of the man in front of each.

#### (10.) FORMATION OF SECTIONS.

“Advance in Section Column, No. 1 Section to the Front—Remainder, Half-right Turn.”

“No. — Section by the Left—Quick March—Front Turn by the Left.”

*From the Halt.*—On the word “Turn,” the commander of No. 1 Section gives the command, “*No. 1 Section, by the Left, Quick March,*” placing himself on the directing flank, in line with the leading rank; the remaining sections turn half-right, and their commanders repeat the command when their sections are disengaged from the section on their right, and give “*Front Turn, by the Left,*” as each arrives in column.

“Advance in Section Column, No. 1 Section to the Front—Remainder, Mark Time—Half-right Turn.”

“*No. 1 Section, by the Left. No. — Section, Forward, Front Turn by the Left.*”

*On the March.*—No. 1 Section leads on, the commander giving the word “*No. 1 Section, by the Left,*” the other section commanders giving “*No. — Section, Forward,*” when disengaged from the section on their right, and “*Front Turn, by the Left,*” when in column.

“Form Company.”

At the word “Form Company,” the rear sections will move up to their places in line with No. 1 Section, by the diagonal march, in double time.

#### (II.) EXTENDING.

“From the Right (or from the Left, Centre, or No. — Squad) to Four Paces, Extend.”

*From the Halt.*—On the word “Extend,” the squad named stands steady; the rest turn outwards, away from the squad named, and march off in quick time, without opening out. As each squad completes the number of paces of extension ordered, it halts and fronts immediately, No. 1 of the squad, before fronting, tapping the next No. 1 of the squad in front of him on the shoulder.

*On the March.*—On the word “Extend,” the squad named will move on in quick time, the remaining squads making a half-turn outwards at the double; each squad, after completing the number of paces of extension ordered,



fronting and resuming quick time, the No. 1 of each squad, before fronting, tapping the No. 1 next in front of him on the shoulder.

(12.) CLOSING.

“On the Right (or the Left, Centre, or No. — Squad) Close.

*From the Halt.*—On the word “Close,” the squad named will stand steady; the remaining squads turning inwards towards it will close in quick time, and will halt and front as they reach their places. *On the March*, the squad named will move on; the remaining squads will make a half-turn towards it, will close on it at the double, fronting and resuming quick time on reaching their places.

In closing, squads will keep a distance of 27 inches from each other.

It is needless to state that the whole of this exercise requires practice, and much of it, and the various portions of the movements in fours to the right (or left) more particularly.

In the field and in ordinary marching the close formation must be abandoned, and the extended order formation substituted. A quick movement to the right (or left) in extended order formation can be made with the greatest ease and simplicity by the command “right (or left) turn,” Nos. 1 and 3 still carrying the stretchers, but horizontally, in front of them, and omitting “move to the right, &c., Nos. 2, &c., carry stretchers.”

*Exercises with Prepared Stretchers.*

(13.) PREPARING AND CLOSING STRETCHERS.

Preparing Stretchers, and all movements with prepared Stretchers, are performed in extended order.

“Prepare Stretchers—Close Stretchers.”

*Prepare Stretchers.*—Nos. 1 and 3 turn to the right, kneel on the left knee, unbuckle the transverse straps, separate the

poles, and straighten the traverses. Each bearer (Nos. 1 and 3), taking a sling, doubles it on itself, dressed side of the leather outwards, slips the loop thus formed on the near handle, and places the free ends over the opposite handle, buckle uppermost. They then rise and front together, working by the right.

*Close Stretchers.*—Nos. 1 and 3 turn to the right, kneel on the left knee, remove the slings from the handles, placing them on the ground, push in the traverses, raise the canvas, and close one pole upon the other; they then rise, lift the stretcher, and face each other, resting the handles between the thighs, rollers to the right of the parade, and roll the canvas tightly round the poles to the right. Each takes up a sling, passes the buckle end to the other, threads the transverse strap through the loop of the other sling, and buckles it tightly round the poles and canvas close to the rackets. Grasping both handles in their right hands, back of the hand to the right, they turn to the right of the company, stooping slightly, then rise and front together.

#### (14.) CHANGING THE NUMBERS.

*(When the Men are standing to Stretchers in Extended Order.)*

“Nos. 1 and 2—Two Paces Left Close—Quick March.”

“Nos. 1 and 2—About Turn.”

“Company (or Section)—Two Paces Forward—March—Front—Stand to Stretchers.”

The Nos. 4 and 3 thus become Nos. 1 and 2 (Fig. 37).

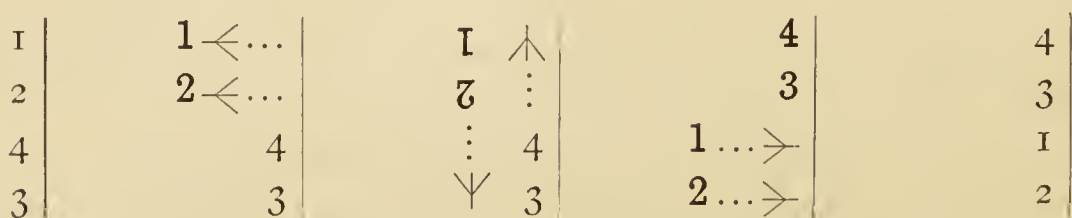


FIG. 37.—Changing numbers.

## (15.) LIFTING AND LOWERING (PREPARED) STRETCHERS.

In turning about when beside the prepared stretcher, Nos. 2 and 4 always turn away from it.

“Lift Stretchers—Two—Three. Adjust Slings.”

“Lower Stretchers—Two.”

Nos. 1 and 3 stoop, grasp the doubled sling midway between the poles with the forefinger and thumb of the right hand, sweep it off the handles, rise, take a side pace to the right between the handles of the poles, and place the sling over their shoulders, dividing it equally, buckle on the right.

*Two.*—They stoop together, slip the loops over the stretcher handles well up to the canvas, commencing with the left handles, and grasp the handles firmly.

*Three.*—They rise slowly together, lifting the stretcher, No. 3 keeping time with No. 1.

*Adjust Slings.*—The Nos. 2 take two paces to their front, next the Nos. 2 and 4; about turn together, the Nos. 4, however, in turning, *turn away from the stretcher*. The Nos. 2 and 4 now adjust the slings over the shoulders of Nos. 1 and 3 so that the slings lie below the collar behind, and in the hollow of the shoulders in front. This done, the Nos. 2 take two paces to the rear, and then the Nos. 2 and 4 front together.

*Lower Stretchers.*—Nos. 1 and 3 stoop slowly and place the stretchers gently on the ground, slip the loops off the handles and stand up, remove slings from the shoulders, double them as before described, holding them at their centres between the forefinger and thumb of the right hand, buckle to the front, hand close to the side.

*Two.*—Nos. 1 and 3 stand to stretchers by taking a side pace to the left from between the handles, stoop, place the doubled slings on the handles as in preparing stretchers, and rise together, taking time always from the right.

## (16.) ADVANCING OR RETIRING.

“By the Centre, Advance.”

“By the Centre, Retire.”

“By the Centre, Advance.”

“Halt.”

*By the Centre, Advance.*—Nos. 4 turn outwards (away from the stretchers) and double round by the heads of the stretchers to the centre of the opposite poles. Nos. 1, 2, and 4 step off with the left foot, Nos. 3 with the right, in quick time, taking short paces of twenty inches, with knees bent, feet raised as little as possible, Nos. 2 stepping short to bring themselves in line with Nos. 4 (Fig. 36 C.).

*By the Centre, Retire.*—Each squad will move round to the right, the No. 3 marking time on his own ground and turning gradually to the rear; the whole retiring when the stretcher is square.

*By the Centre, Advance.*—Each squad will resume the original direction to the front by a movement similar to that detailed for retiring.

*Halt.*—Nos. 1 and 3 halt, Nos. 2 step forward one pace, Nos. 4 turn outwards and double round by the head of the stretchers to their places behind Nos. 2.

## (17.) MOVING TO A FLANK.

“Right (or Left) Incline.”

Each squad will move round on the circumference of a circle, of which its No. 3 is the centre, one-eighth to the right (or left). No. 3 will mark time, turn gradually in the direction named, and the whole will move forward, when facing, in a new direction.

If the “Incline” is repeated, the squads will be in file, moving direct to the flank indicated with an interval of one pace between them.

On the command “Advance” or “Retire,” the original direction to the front or rear will be resumed on similar principles.



## (18.) WHEELING AS IN FILE.

“Left (or Right) Wheel.”

When moving in file, on the word “Wheel,” the leading squad will wheel to the left (or right), leading on when square; the remaining squads move on and wheel at the same point.

## (19.) LOADING AND UNLOADING STRETCHERS.

A party of men to represent wounded will be extended to four paces, marched ten paces in front of the company, and directed to lie down, heads towards the stretcher squads.

“Take Post at the Right of Wounded—Advance.”

Each squad moves off by the nearest way towards the wounded man immediately to its front, halting on his right, opposite to, parallel with, and two paces distant from him.

“Lower Stretchers.” “Prepare Stretchers.”

Stretchers will be prepared as detailed previously (section 13, page 111).

“For Loading—Lift Wounded.” “Two.” “Three.”

Nos. 1, 2, and 3 wheel round the patient's feet (to his left side), No. 3 passing by the left of No. 4, halting when No. 1 is opposite patient's shoulders, No. 2 opposite his hips, and No. 3 opposite his knees, No. 4 remaining steady while this is being done (*see* Fig. 28).

All four bearers then turn inwards together, No. 4 placing himself opposite to No. 2.

*Two.*—All the bearers kneel on the *left* knee, and take hold of the patient thus:—No. 1 passes his left hand across the patient and under his right shoulder, his right hand (and arm) beneath the patient's left shoulder. The patient will be directed to clasp his arms round the neck of No. 1. Nos. 2 and 4 pass their hands and

forearms beneath the patient's hips and loins. No. 3 passes his hands and forearms beneath the patient's legs, hands wide apart.

*Three.*—All slowly lift the patient off the ground and rest him on the knees of Nos. 1, 2, and 3; No. 4 gently disengages himself, doubles round the head of the stretcher to the centre of the opposite side, grasps a pole in each hand, right hand across, lifts the stretcher and places it directly beneath the patient, kneels on the left knee, and again assists in supporting the patient.

“Lower Wounded.” “Two.”

The patient is lowered slowly and gently on to the centre of the canvas, the bearers disengage and stand up.

*Two.*—All “stand to stretchers” as follows:—Nos. 1, 2, and 3 turn to the right, march off, and wheel by the right into their places; (counter-march) No. 4 turns to his left, and wheels round the head of the stretcher into his place, clearing and passing by the left of No. 3.

“Take Post at the Left of Wounded—Advance.”

As before, except that each squad marches to and halts on the left of the wounded.

“Lower Stretchers.” “Prepare Stretchers.”

(As before described).

“For Loading—Lift Wounded.” “Two.” “Three.”

All four bearers wheel round by the foot of the stretcher, No. 4 passing between the stretcher and the patient, Nos. 1, 2, and 3 by the patient's feet to his opposite side (his right), the whole taking up the positions before described—namely, No. 1 by the patient's shoulders, No. 2 by his hips, No. 3 by his knees, and No. 4 opposite No. 2 (*see* Fig. 29).

*Two. Three.* (As before described).

“Lower Wounded.” (As before described). “Two.”

*Two.*—The four bearers “stand to stretchers” as follows:—All turn to the left, Nos. 1, 2, and 3 wheel round the head of the stretcher and pass by the left of No. 4 to their places, No. 4 steps back one pace.

“For Unloading—Lift Wounded.” “Two.” “Three.”  
“Lower Wounded.” “Two.”

No. 4, turning outwards (away from the stretcher), doubles round by the head of the stretcher to the other side ; all four next turn inwards together, No. 1 placing himself opposite the knees, No. 2 opposite the hips, and No. 3 opposite the shoulders.

*Two.*—All kneel and take hold of the patient as before described, except that in this instance No. 3 is taking charge of the shoulders and head, and No. 1 of the knees and legs.

*Three.*—The patient is lifted by all four bearers, and supported on the knees of Nos. 1, 2, and 3, as before described. No. 4 then grasps the stretcher, right hand over, and steps back two paces with it, places it on the ground, doubles round the head of the stretcher back to his place opposite No. 2, and helps to support the patient.

*Lower Wounded.*—The patient is gently lowered to the ground, all four bearers disengage and stand up.

*Two.*—All turn to the left, Nos. 1, 2, and 3 wheel by the left round the patient's head to their places on the left of their stretcher, No. 4 falling in between Nos. 2 and 3 as they pass him.

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## IMPROVISED STRETCHERS.

The following simple way of forming a rifle stretcher was suggested by Sergeant F. J. Spary, M.S. Corps :—

Spread a blanket on the ground, lay two rifles parallel to one another, each ten inches from the centre of the blanket, both muzzles pointing in the same direction, trigger-guards outwards ; turn a fold of the blanket six inches wide over the ends of the butts ; fold the right side of the blanket over the rifle on that side to the rifle on the opposite side, then

similarly fold the left side. A stretcher is thus formed, consisting of three folds of blanket, the end at which the butts are being the head end. It can be lifted and carried in the same manner as directed for carrying field-stretchers when loading wagons.

Rifles should be examined before being used for stretcher poles, and cartridges extracted if found.



## LESSON XII.

### LOADING AND UNLOADING AMBULANCE WAGONS WITH PATIENTS ON STRETCHERS.

A LINE of wagons will be drawn up at close interval (4 yards from near wheel to near wheel) at the rear end of the parade ground, front of the wagons towards the rear. A bearer will be told off as wagon orderly to each wagon.

Stretcher squads will be drawn up ten paces in front of the line of wagons (facing to the front, away from the wagons). Ten paces again in front of the squads a party of patients with rifles and valises will be extended at four paces.

Wagon orderlies will prepare the wagons by withdrawing the linch-pins and letting down the tail-boards and ladders, removing back-boards, and placing them up on end against the near hind wheels.

(27.) LOADING.

“Number the Squads.”

“Odd Numbers—Right Squads.” “Even Numbers—Left Squads.”

“Right Squads—Stand at Ease.” “Left Squads—Stand at Ease.”

“Company—Attention.” “Lift Stretchers.”

“Take Post at the Right of Wounded—Advance.”

“Lower Stretchers.” “Prepare Stretchers.”

“For Loading—Lift Wounded.” “Lower Wounded.”

“Lift Stretchers.”

“Adjust Slings.”

[The above, as detailed for Stretcher Drill.]

“Take Post at the Wagons—Retire.”

*Take Post at the Wagons—Retire.*—The line of stretcher squads retires towards the line of wagons.

The two squads which are on the left as the line retires proceed to the wagon on the extreme left, the next two squads to the next wagon, and so on, to the right of the line, halting one stretcher's length from the tail-board of the wagon without further word of command, the right stretcher squads directly opposite to, and in a line with, the near compartment, and the left squads opposite the off compartment.

While retiring, each No. 2, when ten paces from his wagon, doubles out with the patient's rifle, secures it in its place in the wagon, and rejoins his squad.

“Lower Stretchers” (as usual).

“Fix Slings.”

*Fix Slings.*—Nos. 1 and 3 turn to the right, kneel on the left knee, and fix the slings on the handles as follows:—They slip the loop of each sling buckle-end, dressed side of the leather downwards, over the near handles, close up to the canvas, carry the slings under and round the opposite handles back to the near handles, round which two or three turns are made, pass the transverse strap round the pole between the racket and traverse, and fasten the buckle outside the sling between the poles, and stand to stretchers.

“Stand at Ease” (as usual).

“Left Squads—Attention.”

“For Loading—Lift Stretchers—Two—Three.”

*For Loading, Lift Stretchers.*—The Nos. 3 turn about away from the stretchers, the Nos. 1 and 3 move round by the foot and head of the stretchers respectively to the opposite side, and halt opposite the handles, at the same time the Nos. 2 take a pace forward, and the Nos. 4 a pace back, so as to be opposite the Nos. 1 and 3. All now turn inwards together.

*Two.*—All four bearers stoop and grasp the stretcher poles, Nos. 1 and 4 the handles with their right hands, centre of the pole with their left hands; Nos. 2 and 3 the handles with their left hands, and centre of pole with their right hands, palms uppermost.

*Three.*—The bearers, acting together, slowly lift the stretcher off the ground and stand up, holding it at the full extent of the arms.

“Load—Two—Three.”

*Load.*—Nos. 2 and 4 step off with the left foot, Nos. 1 and 3 with the right, halting one pace from the floor of the off compartment, without further word of command.

*Two.*—The stretcher is raised to a level with the wagon-floor, and the front pair of rollers rested on it. Nos. 1 and 2 fall in, in rear of Nos. 3 and 4, and Nos. 3 and 4, giving the stretcher the proper direction, and avoiding all jerking and jolting, slowly push it home.

*Three.*—The squads fall in in single rank, *facing* the rear end of the wagon, No. 1 on the left, No. 3 on the right, and Nos. 2 and 4 between them.

“Left Turn.” “Left Wheel.” “Quick March.”

“Halt.” “Stand at Ease.”

*Halt.*—The order to halt is given when clear of the right squads.

“Right Squads—Attention.” “For Loading,” &c. &c.

(as for Left Squads above described).

The Right Squads will now be ordered to load the near compartments, and, when this is done, the wagon orderlies replace the back-boards (and ladders, if used) and seat themselves on the back seat of their wagons.

“Company—Attention.” “Advance.”

The company moves off, the squads opening out to their proper interval as they advance.

“Halt.”

The order to halt is given when the squads are in the position from which they retired.

## (27.) UNLOADING.

“Take Post at the Wagons.” “Retire.”

Each squad, wheeling by the right, retires on the line of wagons, as before described, except that Nos. 2 remain with their squads. Wagon orderlies prepare wagons, as for loading.

“Stand at Ease” (as usual).

“Left Squads—Attention.” “Unload.”

“Two.” “Three.”

*Unload.*—Nos. 1 and 3 take two side paces to their right, No. 2 a pace forward, No. 4 a pace back.

*Two.*—Each squad steps forward three paces, bringing Nos. 1 and 2 immediately behind the off compartment. Nos. 1 and 2 each grasps the handle of the pole nearest to him, No. 1 with his left hand, No. 2 with his right, and both, slowly and steadily, draw out the stretcher until the rollers at the foot rest on the end of the floor of the wagon. They support the centre of the poles with their disengaged hands.

*Three.*—Nos. 1 and 2 transfer the head end of the stretcher to Nos. 3 and 4, and each take hold of the handles at the foot end in one hand, centre of the poles with the other. Next, the squad lifts the stretcher clear, lowers it to the full extent of their arms, and, wheeling by the right, carries it foot foremost five paces forward, and halts.

“Lower Stretchers.” “Two.”

Each squad stoops, and lowers the stretcher gently to the ground.

*Two.*—Each squad stands to stretchers, as follows:—No. 1 turns to his right, the remainder to their left; Nos. 1 and 3 march round to their places by the foot and head of the stretcher respectively; No. 2 takes one pace to his rear, No. 4 a pace to his front, and No. 1 turns to his front.



“Stand at Ease” (as usual).

[Patients will be ordered to rise.]

“Right Squads—Attention.” “Unload.”

“Two.” &c. &c.

*Unload.*—The right squads will now be ordered to unload the near compartments, in the same way as above described for left squads ; after which the wagon orderlies fix ladders, back-boards, and tail-boards, while the squads are “standing to stretchers.”

“Company—Attention.” “Close Stretchers.”

*Close Stretchers.*—Slings will be unfixed and placed on the ground, and stretchers closed, as before detailed.

“On the Right—Close.”

“Company, By the Right—Quick March.” “Halt.”

“Lower Stretchers.” &c. &c.

[As detailed in Stretcher Drill.]

**Wagon Drill.**—Where Mark I. Wagon is in use, the wounded, when brought to it, must be transferred from the stretchers they occupy to those belonging to the wagon. In the following words of command this transfer is provided for :—

*To Load and Unload Mark I. (old pattern)  
Ambulance Wagon.*

TO LOAD.

“For Loading, Take Post at the Wagons.” “Retire.”

“Lower Stretchers.” “Stand at Ease.”

“Left (or Right) Stretcher Squads—Attention.”

“Lift Wounded.”

“Lower Wounded.”

“Lift Wagon Stretchers.”

The position assumed by the bearers at this word of command will be the same as in the command “lift stretchers” in the drill for loading the present pattern wagon.

“Load.”

“Right Turn.” “Right Wheel.” “Quick March.”

“Halt.”

“About Turn.” “Stand at Ease.”

“Company—Attention.” “Lift Stretchers.” “Advance.”

The right (or left) squads will then transfer the patients from their own to the wagon stretchers—only the right (or

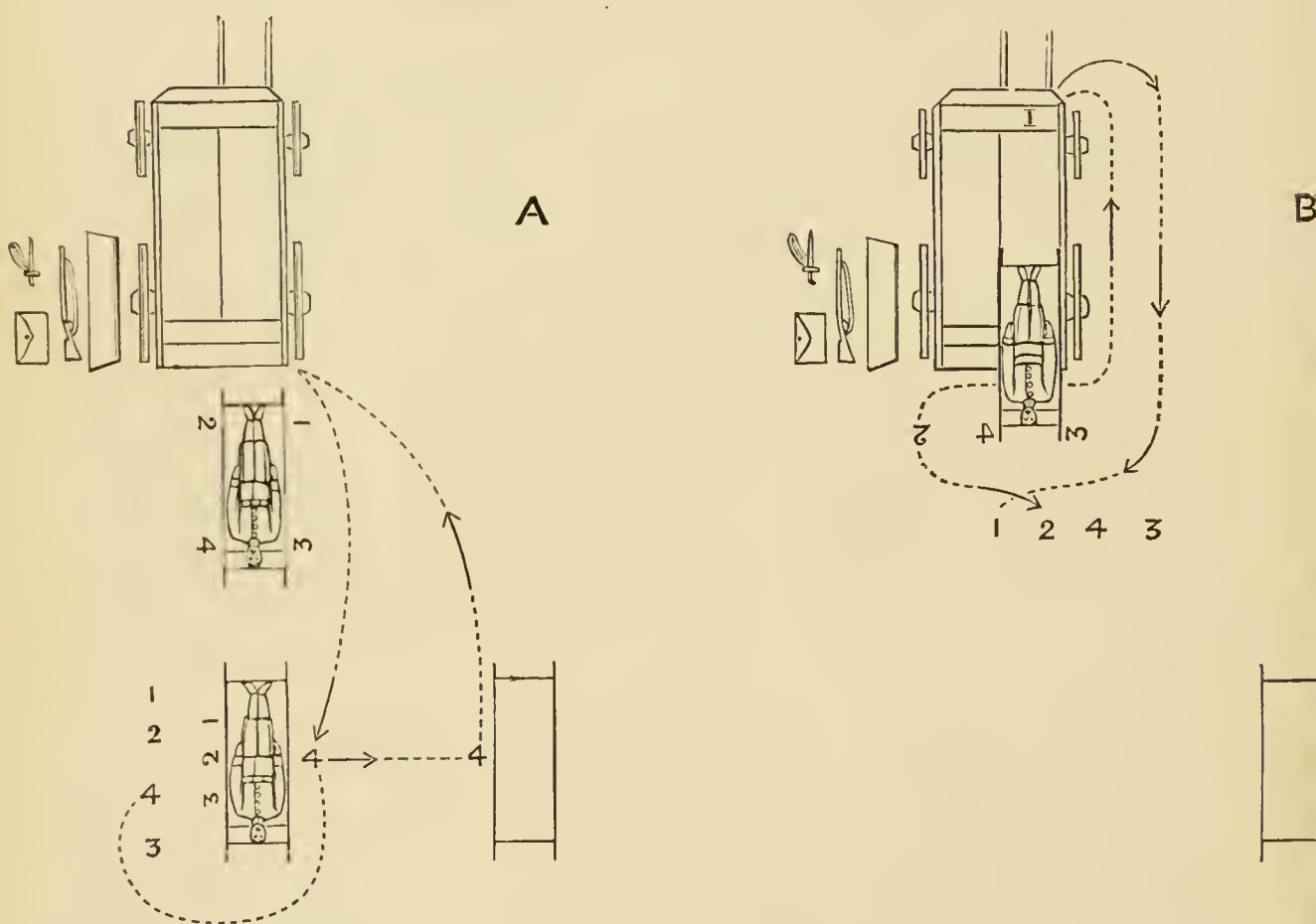


FIG. 38.—Loading Mark I. ambulance wagon.  
Right stretcher squad loading.

left) squads, as warned by command, the squads not named standing at ease.

*Right Stretcher Squads—Attention—Lift Wounded.*—As soon as the patient has been lifted [see Stretcher Exercise, “For Unloading—Lift Wounded,” Lesson XI.], No. 4 draws the stretcher away four paces to the right, doubles to the end of the wagon, and draws out of the off (or right) compartment the prepared stretcher belonging to it, looking to

the No. 4 of the squad on the extreme left for the time ; then, standing on the right of the stretcher, and laying hold of it at its centre--left hand over on the pole opposite to him, right hand under on the pole near him, keeping it horizontal--advancing carefully with it he rejoins his squad, placing it under the patient, close against the other three bearers' feet (Fig. 38 A), and then helps them to lower him.

*Lower Wounded.*—The patient is next lowered upon the wagon stretcher, and 4, 3, 2, and 1 stand to stretchers, the next command being—

*Lift Wagon Stretchers.*—No. 3 turns to the left-about, moving round by the head of the stretcher to the opposite side ; No. 1 also at the same time moves round by its foot, and they both halt opposite the ends of the pole facing inwards towards the stretcher ; No. 2 takes a pace to his front, No. 4 to his rear, both fronting inwards towards the stretcher.

*Two.*—All stoop down and grasp the poles. Nos. 2 and 3 grip the ends of the poles with their left hands, and the centres with their right ; Nos. 1 and 4 grip the ends of the poles with their *right* hands, the centres with their left—palms uppermost in every case.

*Three.*—All four bearers together lift the wagon stretcher off the ground, and stand up, holding it at the full length of the arms.

*Load.*—The four bearers advance with the stretcher held as explained in the last paragraph towards the end of the wagon (Fig. 38 A), the front and rear rank men “breaking step,” halting one pace from the rear of the wagon without further word of command.

At *Two*, the stretcher is raised to the floor of the wagon, the front pair of wheels resting upon it. Nos. 1 and 2 now come away from the tail-board of the wagon, retiring behind 3 and 4 (<sup>1</sup>No. 1 doubles round by the off side of the wagon,

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<sup>1</sup> See NOTE at end of this Lesson.

gets up upon the driver's seat, leans in, and makes ready to guide the poles of the stretcher). No. 2 retires to the head of the stretcher and takes charge of the handles, whilst 3 and 4, with No. 2, slowly introduce the stretcher till the rear wheels touch the end of the floor.

At *Three*, the rear wheels and end of the stretcher are lifted up and the latter pushed home.

No. 1 now comes down from the front of the wagon and re-joins his squad, which is drawn up in single rank immediately in rear of the wagon and facing it (Fig. 38 B). The squad is now retired to a line abreast of the left stretcher squad.

The left detachment will now go through the same exercise, the only differences being (*a*) that, when the patient is lifted, No. 4 will draw the stretcher away to the right only as far as to be clear of the right (the off) wheel; and (*b*) before retiring to their places in line after loading, the Nos. 2 of the left squads will replace the back-board and cushion.

Both right and left squads will now stand to their own stretchers, will lift stretchers, and advance to their original starting-point, where the stretchers will be lowered and the squads form up at the stand to, in readiness for the exercise of—

**Unloading Wagons.** The words of command are :—

“For Unloading, Take Post at the Wagons.” “Retire.”

“Right Stretcher Squads.” “Unload.”

“Lower Stretchers.” “Stand at Ease.”

“Left Stretcher Squads.” “Do. do. do.”

“Company (or Section) Attention.” “<sup>1</sup> Return Wagon Stretchers.”

“Unfix Slings.” “Lift Stretchers.” “Advance.”

The squads in pairs retire to the wagons, halting directly in rear of the tail-board, right squad behind the off compartment, left squad behind the near one. The left squads will stand at ease.

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<sup>1</sup> See NOTE at end of this Lesson.



“Right Stretcher Squads.” “Unload.”

“Two.” “Three.”

Nos. 1 and 3 take a side pace to the right ; No. 2 one to the front ; No. 4 one to the rear.

*Two.*—No. 2 lifts off the backboard and cushion from the wagon, placing them on the ground outside the near hind wheel. He then returns to the end of the wagon, and, together with No. 1, grasps the wagon stretcher in the right or off compartment, No. 2 by the left handle, No. 1 by the right ; they both then slowly draw it out till its front wheels rest at the hind end of the floor.

*Three.*—Nos. 1 and 2 now hand over the head end of the stretcher to Nos. 3 and 4 behind them, and next proceed to lay hold of the foot end of the stretcher, upon which it is lifted clear of the wagon and carried by the four bearers one stretcher's length to the direct rear, halting without word of command. “Lower stretchers” will next be given, and next “Stand at ease,” &c. &c.

The left stretcher squads will unload by just the same steps. The wounded will either be ordered to rise, or else they will be transferred to other stretchers. The same words of command will be used as in loading ; the Nos. 4 withdrawing the wagon stretchers and replacing them in the wagon and substituting another. When the transfer is not to be made, and the dummy wounded ordered to rise, the command “Return wagon stretchers” will be given, when the Nos. 4 of either the right or left detachments, whichever are ordered, will double round to the opposite side of the wagon stretchers, and, working by the No. 4 on the left of the line, replace them in the wagon, rejoining their squads.

When it comes to the turn of the Nos. 4 of the left squads, after replacing the stretchers, they will put up the tailboards and cushions before rejoining their squads.

NOTE.—*Ambulance Wagons.*—The Mark I., or oldest pattern wagon, has stretchers of a special form, called wagon stretchers, and holes cut in the fore-board for the

reception of the handles. It is to guide these handles into the holes that No. 1 has to mount on the driver's seat after "Load—two" (*see* Fig. 38 B.).

In the Mark III. and in the latest pattern wagons, the stretchers are those brought to the wagon, and there should be no transfer of patients; and as there are no receiving holes cut for their handles, No. 1 need not mount the fore-carriage.

*Fix Slings.*—Slings are fixed round the handles of the stretchers if these are to be left in the wagons.

Where no stretchers are available, patients unable to walk or to be carried by either the two, three, or four-handed seats will be carried to the wagons by the four bearers on improvised stretchers, or if this is impracticable, as follows:—The four bearers, following as far as possible the instructions for the command "Lift wounded," will rise from the kneeling position slowly to their feet, and will carry a wounded man carefully to the wagon, on reaching which No. 4 will climb into the wagon, and assist the other three bearers to lift in the patient and place him on its floor in the recumbent position, if necessary.

The duties of members of the bearer corps in modern armies are very similar to those of trained nurses or hospital attendants with, in addition, a knowledge of drill adapted to stretcher carrying or bearing, and a special training in the immediate treatment of accidents and emergencies, particularly of those to be found on active military service.

It is in this latter branch of ambulance knowledge that the regimental bearers of a corps or regiment are instructed, that the resources of the bearer companies proper—made up of orderlies of the Medical Staff Corps—shall not be too heavily drawn upon in the forefront of battles, where, from the number of gunshot and other casualties, without auxiliary (regimental) bearer assistance, the wounded would have to lie unattended to perhaps for hours at a time.

It is clear, therefore, that if regimental bearers are taught but little in comparison with the bearers of the Medical Staff Corps, that little they should know thoroughly ; for upon their presence and immediate assistance—or First Aid—will the wounded principally depend, as the following brief outline of the provision for the treatment and transport of the wounded in our own army in the field will show.

*With the fighting line* in the front are the regimental bearers, under the command of the surgeons attached to each battalion and body of corps troops ; these render First Aid to those who fall, applying first dressings or splints, checking bleeding, giving water, and bearing the wounded to the rear, off the immediate field of battle. As the regimental bearers are never to lose touch of their corps during an action, they will only transport the wounded short distances, being met by the bearers of the bearer companies (Medical Staff Corps), who will relieve them of their burdens, carrying the injured to the collecting station, where some ambulance wagons are in waiting. The collecting station is, as its name implies, only a *rendezvous* for the stretcher detachments of the Medical Staff Corps, and is a spot as near to the fighting line as it is possible to select, with a view to shelter from rifle bullets.

Regimental bearers are in no case to go further to the rear than this spot ; here the injured are placed in the wagons and sent to the dressing station, half a mile or more to the rear, and from this to the field hospital, about two miles still further on.

Now that the circular order for the formation of Brigade Bearer Companies has been issued, *in the Volunteer service*, the collecting station service, and probably that also of the dressing station, will be performed by the brigade bearers. This new departure will necessitate some further extension of the ordinary instructional course for regimental bearers ; and in the second part of this book will be found a series of lectures compiled with that end in view. I

venture to hope that a study of them and mastery of their contents will be of material assistance to those regimental bearers who aspire to become "brigade bearers," and prove of interest to others whose commendable thirst for ambulance knowledge, after obtaining the much-coveted distinction of wearing our red cross badge, prompts them to cry for more in the shape of "advanced" lectures from the medical officers of their corps.

For a plan of the ambulance arrangements for a division in the field (*see* Fig. 39, page 166).



## APPENDIX TO PART I.

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### QUESTIONS AND ANSWERS.

FOR descriptive purposes, how is the skeleton usually divided?

Into Head, Trunk, Upper Extremities and Lower Extremities.

Name the bones forming the cavity of the skull, and what important organ do they protect?

The frontal, in front; the occipital behind; the two parietal above; the two temporal at the sides; the ethmoid and sphenoid inside forming the floor forming the cavity containing the brain.

Mention those forming the face, and any important parts they enclose.

On each side, the malar and superior maxilla (jaw), forming with the frontal bone and sphenoid above the socket for the eye; the nasal, with the superior maxilla forming part of the nostril; the inferior maxilla (jaw) with the two upper jaw bones forming the cavity of the mouth containing the tongue; the temporal bones contain the apparatus of hearing.

What is the spinal column, and what do you mean by a vertebra?

It is a pillar of ring-like bones, one above each other, supporting the skull, and forming a tube for the

passage of a bundle of nerves from the brain known as the spinal cord. The spinal column is divided into 24 bones, each called a vertebra (plural, *vertebræ*) 7 in the neck, 12 in the back, and 5 in the loins. To the 12 in the back—called dorsal,—are jointed on either side the 12 ribs.

---

What are the several bony parts of the trunk?

The *vertebræ* or spinal column, the 24 ribs, the sternum or breast-bone, and the pelvis; the latter 4 large irregular bones forming the haunch and lower part of the trunk.

Name the bones of the pelvis.

The sacrum and coccyx behind, upon the former of which the spinal column rests;—and the “*os innominatum*, right and left, or “nameless bone,” or haunch bone, forming the sides and front,—all 4 bones jointed together forming an irregular basin-like cavity protecting the urinary bladder and some other vital organs.

What are the bones forming the upper extremity?

The shoulder-blade or scapula.

The collar-bone or clavicle.

The arm, or humerus, the long bone from the armpit to the elbow.

The forearm or radius and ulna, two bones; the radius on the thumb side, the ulna on the little finger side, from the elbow to the waist, and the bones of the hand.

The bones of the hand are divided into 3 sets:—those forming the wrist, called the *carpus*; those forming the palm, called the *metacarpus*; and those forming the fingers, called *phalanges*.

What are the bones forming the lower extremity?

The femur, or thigh bone; the patella, or knee-cap in front of the knee-joint; the tibia and fibula, forming

the leg from knee to ankle,—the tibia being the shin-bone ; the fibula the long, delicate bone, called sometimes “the splint-bone,” running down the outer side of the leg ; the tarsus or ankle ; the metatarsus or foot ; and the phalanges or toes.

---

Where two or more bones meet a joint is formed. What are the substances besides bones, which enter into the formation of joints ?

Cartilage, ligaments, capsule, and synovial membrane.

The first, popularly known as gristle, is a strong tough, semi-elastic material placed between the ends of bones to prevent friction and jarring. Ligaments are intensely strong fibrous bands which bind one bone to another ; the capsule is a sort of sock or bag, under the ligaments, and spread over the ends of the bones ; and the synovial membrane inside the capsule furnishes the synovial fluid, a material to lubricate the joint.

Give the chief varieties of joints, with an instance of each.

Fixed, as in the bones of the skull.

Moveable, as the hip, the shoulder, the knee, and mixed joints—allowing various but limited movement, for example the joints of the vertebræ.

Joints may also be divided into hinge-joints, as the elbow, the knee, the fingers ; and ball-and-socket joints, *e.g.*, the hip, and the shoulder joints.

There is a substance immediately covering a bone. What is this envelope called ?

The periosteum.

What are its uses ?

It protects and nourishes the bone, which derives most of its blood supply from the blood vessels of this membrane. It further plays an important part in

the repair of bone when fractured, depositing around and between the broken ends, material from which the new bone is formed.

What is this material or deposit called, and of what does it consist?

Callus :—of the salts of lime chiefly, of which the earthy part of bone consists.

---

What is meant by a simple fracture?

Where the bone is broken once without any wound communicating with the surface of the body.

What is a compound fracture?

Where, in addition to the fracture, there is a wound of the soft parts leading from the seat of fracture to the outer surface of the body.

What are complicated and comminuted fractures?

(a) Where in addition to the fracture there is found to be a wound of some important organ or blood vessel near it : as for instance a wound of the lung in fractured ribs, a laceration of the femoral artery in fractured femur.

(b) Where a bone is fractured in two or more places, the fracture is comminuted.

Why is the utmost care needed in handling a case of suspected fracture, or in moving a patient with a fractured limb?

Because a simple may be easily turned into a compound fracture by a sharp end of broken bone penetrating the soft parts around.

Mention some of the signs of fracture.

Pain at the seat of injury ; uselessness of the limb below the fracture, and often pain in moving it ; unnatural movement of the limb ; crepitus, and deformity.

---



What do you mean by “crepitus,” and is there always deformity?

A peculiar grating feeling communicated to the hands of anyone moving the broken limb when the broken ends of the bone happen to rub together.

Deformity is sometimes very marked—for example, in fractures of the clavicle, radius, and fibula, but is not always found.

Having determined that a fracture exists, what is the first thing to do in rendering First Aid?

To disturb the limb as little as possible, and to place it in its natural position, securing it by means of splints and bandages.

Supposing the patient is lying on the ground, should your splints and bandages be applied at once or after the case is lifted from the ground?

At once; on no account should the patient be lifted or moved till the splints and bandages have been put on.

How can you ensure that the ends of the broken bone shall be prevented from moving?

By choosing a splint or splints long enough to reach from the joint above the fracture to the joint below it, thus ensuring that the whole limb may be fixed.

Give an illustration of what you mean.

In the case of a fracture of the tibia, the splint should be long enough to extend from above the knee to below the ankle.

Give a second example.

In a fracture of the femur, a support or splint long enough to reach from the armpit to the foot should be used, and, if possible, a second splint on the inside long enough to reach from above the knee-joint to the foot.

---

The soft parts covering the skeleton consist principally of muscle ; what are the functions of muscle ?

Muscles are red masses of flesh arranged in bundles, or fibres, which, under the influence of the will, have the property of shortening or of lengthening. As these flesh-bundles are attached to different bones, in shortening or lengthening, the limbs and various bones are made to move.

Mention the varieties of muscle, and give instances of each.

(a). Voluntary, *i.e.*, under the control of the will, *e.g.*, the biceps, the large muscle in front of the arm, the muscles attached to the thigh and leg, to the thumb, &c.

(b). Involuntary, *i.e.*, the muscle which contracts or relaxes without reference to the will, *e.g.*, the heart, the muscle of the stomach, the muscle of the bowel.

The thorax, or cavity of the chest, contains several important organs ; name them.

The heart, large vessels and nerves, the windpipe, the lungs.

What organs are found in the abdomen, or lower cavity of the trunk ?

The stomach, sweetbread, the spleen, the two kidneys, the large and small intestines, the bladder, and large blood vessels and nerves.

---

What is a nerve ?

A nerve is a thread-like portion of that part of the body tissue known as the nervous system.

Briefly, what is the nervous system ?

The nervous system consists of two different arrangements of nerve matter. The first is called the cerebro-spinal system ; the second the sympathetic system.

Of what does the cerebro-spinal system consist ?

Of the brain, the spinal cord, and nerves springing from them.

The brain is the seat of the will, and of the sensations ; how are these communicated to the various parts of the body ?

By the nerves proceeding from brain and cord to the muscles, to the various organs of the body, and to the skin.

What parts of the body, or which of its actions, does the sympathetic system control ?

The involuntary muscles ; the sympathetic nerves, which are nerve bodies arranged in a chain-like row on each side of the spine, also regulate all the vital functions, and the supply of blood to the internal organs of the body.

---

About one-thirteenth of the total weight of the body is due to the blood contained therein ; what do you suppose are the functions of this fluid ?

The blood conveys nourishment to all parts of the body.

It also is the carrier of oxygen, a nutritive gas, to the tissues which need it.

It furnishes warmth and moisture to the body, and it also removes from the body used-up and refuse material.

What organs are concerned in carrying on the circulation of the blood ?

The heart, the system of blood vessels, and the lungs.

Describe the heart briefly.

The heart is an organ composed principally of muscle. It is divided into two halves, left and right, the two

halves being again divided into upper and lower ; thus the heart is divided into four chambers. The two upper are called auricles ; the two lower, ventricles. Each auricle opens into the ventricle below it, but there is no opening from auricle to auricle, nor from ventricle to ventricle. The heart is really a muscular pump, the auricles being the receiving chambers, and the ventricles the pumping apparatus. With each contraction of the ventricles, the blood is pumped into the arteries.

How many kinds of blood vessels are there ? Describe each variety briefly.

Three—arteries, capillaries, and veins. The arteries carry nourishing pure blood from the heart—with the exception of the pulmonary artery—to the various parts of the body, becoming smaller and finer as they travel away from the heart, ending in many minute blood vessels—the capillaries.

The capillaries are fine hair-like blood vessels through which the blood filters, giving up nourishment, and afterwards collecting waste material ; and then passing the blood stream into a third set of vessels called veins.

The veins, with the exception of the pulmonary veins, contain impure dark blood, and convey it up to the right side of the heart.

An artery contracts and forces the blood along to the capillaries with each beat of the pulse.

A vein does not beat like an artery, the blood stream merely flowing steadily through it : a vein also differs from an artery in having valves, which open only in the direction of the heart.

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Give an outline of the circulation of the blood.

The blood, having been purified and partly nourished in the lungs, is brought by the pulmonary veins to the left auricle. The left auricle passes it into the left ventricle, which pumps it into the aorta, and thence



into the arterial system. The capillaries next take up the blood stream, abstracting nutriment, and substituting waste products ; they then pass it on to the veins in an impure condition, the veins (except the pulmonary veins) pass the blood forward to the right auricle, which discharges the blood into the right ventricle, and lastly, the blood stream is conveyed from the right ventricle to the lungs by the pulmonary artery. After purification in the lungs, and circulating through the lung capillaries, the blood stream is carried by the pulmonary veins into the left auricle, and so the circuit is completed.

How are the lungs concerned in the circulation of the blood?

In the act of inspiration we breathe in air which, if pure, contains a certain proportion of oxygen gas.

The air passes into and distends the air-cells over which the lung capillaries are spread ; the oxygen of the air is taken up by these lung capillaries, and refuse matter, in the form of carbonic acid and moisture in the blood, exchanged for it. Thus the lungs play a most important part in the circulation of the blood, aerating or oxygenising it, and, in the act of expiration or breathing out, getting rid of impurities.

What is the cause of the brilliant red colour in the blood spouting from a wounded artery?

The presence of oxygen and absence of impurities.

The blood welling out from a wounded vein is dark in colour. What is the cause of this?

The presence in the blood from a vein of carbonic acid and of other impurities.

Does the process of breathing or respiration consist of one act?

No. First, the act of inspiration, or breathing in fresh air ; Second, the act of expiration, or breathing out foul air ; Third, a short pause.

Is respiration, then, a compound act ?

Yes, consisting of the above three occurrences.

How many respirations should occur in a minute ?

Eighteen, in health.

How many times in a minute should the pulse wave occur ?

In health, about seventy-two times.

In inspiration, the chest expands. How is this ?

The outside air rushes in and distends the air-cells, the costal muscles attached to the ribs contract and raise the ribs, and the diaphragm, a large muscle forming the floor of the chest cavity, contracts and flattens downwards, also enlarging the cavity.

What occurs in expiration ?

The converse of the above. The costal muscles relax, and so the chest falls in ; the diaphragm relaxes, arches upwards, and the air-cells partly collapse and expel the air, thus emptying the lungs.

In describing expiration, it was mentioned that a certain amount of moisture was got rid of by the lungs. By what other organs does the body throw off moisture and water ?

By the excretory organs, namely, by the skin, the kidneys, and, to a certain extent, by the bowels.

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What is the name of the large artery of the neck ?

The carotid artery.

Can this artery be compressed by the fingers ? and how ?

Yes. By pressing backwards over a line to the outer side of the windpipe this vessel may be compressed against the vertebræ of the neck behind it.

Mention two other arteries in this locality which you can readily detect with the finger.

- (a.) The facial, about midway along the edge of the lower jaw-bone, between the chin and angle of the jaw, can be distinctly felt and compressed against the bone by the finger.
- (b.) The temporal, which can be traced ascending the face, just in front of the ear, and branching forward on the temple.

What artery supplies the upper extremity? and what names are given to this blood vessel on its course towards the elbow?

The subclavian, which may be compressed with the thumb by pressing deeply down behind the middle of the collar bone (clavicle) against the first rib, at the same time drawing the shoulder forwards. In the armpit, or axilla, the main artery is called the axillary; from the head of the humerus to the elbow, the brachial.

Can the axillary artery be compressed?

Yes, against the head of the humerus.

Where are the radial and ulnar arteries?

In the forearm. At the front of the elbow, the brachial divides into two; the outer or thumb side branch is the radial; the inner or little finger side artery is the ulnar.

Can the brachial artery be compressed against the humerus?

Yes, against the inner side of the middle of that bone. The line of the artery may roughly be given as the same as the inner seam of a man's coat sleeve.

Can this artery be elsewhere compressed?

The lower portion of the brachial artery may also be compressed by placing a pad (a small roller bandage

will do) in the hollow of the elbow in front, bending the forearm upwards against the arm, and fixing it in that position with a bandage or handkerchief.

Where may pressure be applied to the radial and ulnar arteries?

The radial can be compressed against the radius, and the ulnar artery against the ulna, just above the palm of the hand.

These two arteries form circles of vessels supplying the palm of the hand; how may troublesome bleeding from this part be checked?

By placing a firm hard pad in the palm of the hand, closing the fingers over this, and tightly bandaging them up, and by elevating the forearm, if necessary; also compressing the lower brachial, as above described.

What is the name of the main artery of the lower limb? Give a line which will cover its direction in the upper third of the thigh.

The femoral. Select a point midway between the symphysis pubis and the prominence known as the spine of the ilium (part of the haunch bone); draw a line from the point mentioned to the inner edge of the knee-cap. This imaginary line will cover the direction of the artery.

How and where may the femoral artery be compressed?

(a) By the two thumbs, one above the other, pressing deeply inwards and upwards against the pelvis at the point midway in the groin.

(b) Also against the femur itself, about  $3\frac{1}{2}$  inches below the edge of the pelvis, over the imaginary line already described. The wounded thigh should be relaxed by crossing the leg over the knee of the sound side, or by raising the foot and bending the knee.



Can a tourniquet be used, and, if so, in which of the two pressure places you have mentioned?

Yes, in the second, and it should be applied in every case, as the strain on the thumbs is so great that they cannot be relied on to keep up compression for long.

The femoral artery winds round the lower part of the femur into the ham or popliteal space. What is its name in this locality, and can it be compressed, and if so, by what means?

In the ham it becomes the popliteal artery. It can be compressed by placing a hard pad in the hollow of the ham behind the knee, bending the knee forcibly, and bandaging the leg back upon the thigh.

What becomes of the popliteal artery?

It divides into two chief branches supplying the leg—(a) the anterior tibial; (b) the posterior tibial. The anterior tibial passes forward and down the outside of the tibia or shin bone to the middle of the instep of the foot. The posterior tibial is deeply seated in the back part of the leg, but comes to the surface lower down—it may be felt throbbing behind the inner ankle—passing into the foot, there giving off many branches.

State where these two vessels may be compressed.

The anterior tibial, by a pad against the bone just above the ankle, also on the instep; the posterior tibial, by the finger or pad behind the inner ankle prominence.

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What is meant by hæmorrhage and what are the two chief classes of it?

Bleeding, or the loss of blood. Internal, *i.e.*, bleeding

going on from some organ or part inside the body ; and external, *i.e.*, bleeding from a wound of the surface of the body.

What are the varieties of external hæmorrhage ?

Hæmorrhage from an artery ; from a capillary ; and from a vein.

What are the distinctive differences between hæmorrhage from an artery, and that from a vein ?

From an artery, the blood comes out in jerks, is of a brilliant scarlet colour, and pressure, if applied in the right direction between the heart and the wound, will check it.

From a vein, the blood wells up in a steady stream, is of a dark purplish hue, and pressure, when applied between the heart and the wound, does not check the flow.

How would you know capillary hæmorrhage ?

It is slight, and comes from the whole surface of the wound, usually checking on exposure to the air, or on the application of cold.

In First Aid assistance, what are the means at our disposal for arresting hæmorrhage ?

Pressure, position, and the application of cold.

How may pressure be applied ?

Either directly, *i.e.*, by pressure in the wound itself ; or Indirectly, *i.e.*, by pressure applied outside the wound upon either the main artery or vein, according to the class of bleeding.

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In a wound with arterial bleeding, what is the first thing to be done ?

To make direct pressure in the wound, upon the point of bleeding, with the tip of the finger.

This is but a temporary measure, what should next be done?

Pressure must be made over the main artery, between the wound and the heart, till surgical assistance can be procured.

What means may be employed to exercise this pressure over an artery?

Either direct compression by the fingers, or by the application of the apparatus called a tourniquet.

What is a tourniquet?

It is a strap or band, with a pad, which encircles a limb, capable of being tightened to such an extent that the arteries are compressed, and the flow of blood through them checked.

Why is the prolonged use of a tourniquet, such as you have described, objectionable?

Because not only is the main artery supplying the limb compressed, so that the circulation through it is stopped, but the lesser circulation through the smaller arteries also, and the return circulation through the veins as well.

What is likely to occur when the blood supply is cut off by a tourniquet too long or too tightly applied?

Mortification, *i.e.*, the death of the limb.

In bleeding from a vein, what is the treatment?

That by position. Elevate the limb, let the patient lie down with the wounded limb well raised; and also treat by pressure, by means of a pad placed over the wound, tightly bound on.

In capillary hæmorrhage, is much interference necessary ?

As a rule, no. Exposure to the air, or to a stream of cold water, is generally enough to stop the bleeding ; if not, a pad over the wound, and a bandage, should be applied.

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What form of bandage is most useful in First Aid assistance ? How is it made ?

The triangular, or Esmarch's.

By cutting a square yard of linen or calico diagonally into two.

What are the advantages of using this form of bandage ?

It may be quickly applied ; it may be folded either broad or narrow ; used as a wide bandage ; also as a sling, and as the strap of a tourniquet.

In tying off this bandage, what form of knot should be made ?

The reef knot.

What is a splint ?

A support, made of some stiff material, usually wood, applied to an injured limb with bandages or straps, to ensure immobility.

In the field, what articles of equipment and materials may be extemporised as splints ?

For long splints—rifles, carbines, hand-spikes, gun-sponges, sabres, scabbards ; for leg splints—scabbards, swords, flag-sticks ; for short splints—bayonets, bayonet-scabbards, drum-sticks, telegraph wire, stiff leather, cardboard, tin, zinc sheeting, boughs from trees, palings, straw, wood from boxes, &c.

In a fracture of the femur, what kind of extemporised splint would you use ? and, before lifting the case, what precautions would you take ?



The splint should be a rifle, or something long enough to reach from the axilla to the ankle ; at least six triangular bandages must be used, and the injured limb should be bound to the sound one before lifting the patient.

Why should a man on a stretcher, with a fractured femur or tibia, be carried head foremost down a hill ?

To prevent the weight of the body from pressing down on the seat of fracture, and from over-riding and disturbing the helpless fragment below, possibly converting a simple into a compound fracture.

In ascending a hill, with the same class of injury, how would you carry your man ?

Feet foremost, and for the same reasons.

Are ordinary splints applied next to the skin ?

No ; they are padded, or lined.

In applying an extemporised splint, would you disturb the clothing to apply it ?

No ; splints in First Aid assistance should be applied always outside the clothing, except where it may be necessary to rip up the garment to get at a wound to check bleeding.

In such cases, how would you ensure disturbing a limb as little as possible ?

In the case of an injured arm, by cutting the stitches of the inner seam of the sleeve ; in the leg, cutting the outer seam stitches of the trousers ; in the foot, by cutting down the back seam of the boot.

In fractures of long bones, the fragments usually over-ride and cause deformity ; to remedy this, before applying a splint, what should you do ?

Extend, and get help to counter extend ; extension being kept up while the splint is being put on.

In case of fracture, complicated with bleeding, in what order would you proceed to attend to these?

First, attend to the wound and check the hæmorrhage, if necessary applying a tourniquet. Second, after bleeding has ceased, apply the splint.

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What is an incised wound?

One with clean-cut edges, caused usually by a sharp instrument.

What do you mean by a lacerated, and by a contused wound?

The first is one the edges of which are irregular or torn; the second, a wound with bruised edges.

What is a punctured wound?

One produced by a sharp pointed weapon, such as a bayonet or dagger or lance.

In what kinds of wounds do you get most hæmorrhage?

In incised, and often in punctured wounds.

What is the First Aid treatment of a wound?

First, stop the bleeding; it may be necessary to apply a tourniquet to the main artery of the limb above the wound, or to apply a graduated compress to some bleeding point in the wound; Second, clean the wound; Third, apply a dressing and bandage.

What is a graduated compress, and how do you make and apply one?

The graduated compress is a cone-shaped inverted pad of lint. It is made of several pieces of lint folded firmly into pads, each successive pad being slightly larger than the one next below it. A small bit of lint is tightly folded into a small hard pad about as small as the tip of the finger. This first

pad is placed immediately over the bleeding point in the wound and firmly pressed down ; then a second pad a little larger is prepared and placed over the first. A third, a fourth, a fifth are made, each somewhat larger than the last, and placed one over the other, thus making a cone-shaped pad of lint, the point of which presses on the bleeding point in the wound, and the base of which rises up above the edges of the wound ; this pad is finally secured by a bandage, and, if properly made and applied, will exert sufficient pressure to check bleeding, unless the vessel wounded be a large one.

In a wound with but little bleeding, what would be your procedure ?

Cleanse the wound by pouring a stream of cold water gently over it ; bring the cut or torn edges together by applying small pads on either side the wound—the pads should be of lint and may be damped with water or applied dry ; and bind up with a bandage.

What should be the treatment in cases of gunshot wounds ?

First check hæmorrhage, and then apply a first dressing.

What are the peculiarities of a gunshot wound ?

Often there will be two wounds,—the first, that made by the entrance of the bullet, the second being made by its exit. A gunshot wound may be punctured, lacerated, or contused, and often a combination of these ; its edges may also look burnt ; and in many cases there will be much smashing of bone. Wounds caused by large projectiles are always extensive, and the hæmorrhage so great as to terminate life in a few minutes.

What does a first dressing consist of ?

At present the regulation first dressing consists of a

pad of compressed medicated "charpie" (a kind of soft tow), some gauze, a piece of waterproofing, and a bandage.

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What would be the treatment of a burn?

Remove any burnt cloth, &c. &c., from the wound very carefully, and exclude the air from the burned surface by at once applying a dressing, which should be lint well oiled (olive oil) or "carron" oil, or some simple ointment, over which place a thick layer of cotton wool, wrapping the limb round, securing by a bandage.

What do you mean by carron oil?

Equal parts of linseed oil and lime-water.

In the absence of oil or ointment, what would you apply in an emergency?

Ordinary baker's flour or powdered chalk, wrapping round with cotton wool.

What is the treatment of a scald?

The dressings should be as for a burn.

What would you do in a case of dislocation, and in a sprain?

In the first, prevent the patient from making the least use of the injured joint till seen by a surgeon.

In cases of sprain, apply a bandage, if possible a wet bandage, to the joint, and keep it at rest.

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In case of foreign body in the eye, what should be done?

First prevent the patient from rubbing or knuckling the eye affected, next turn the patient's face to a good light, stand in front and try to find the foreign body,



gently try to dislodge it with a bit of clean paper folded into a point.

If lime has got into an eye, what is to be done ?

At once bathe the eye with vinegar and water ; bathe it well, and remove the lime, if necessary, with a camel-hair brush or moistened feather.

Can you suggest any other liquid with which to bathe an eye inflamed by lime ?

Lemon-juice, lime-juice, or orange-juice and water ; any weak acid and water.

Should oil be put into the eye ?

No ; the oil is sure to form a paste with the lime ; on no account put oil in, no matter who recommends it ; continue to bathe the eye, as directed, with weak acid and water, or vinegar, till all the lime has been washed out ; then cover up the inflamed eye with some lint soaked in vinegar and water.

Briefly state what should be done in frostbite.

Rub the affected part with snow or ice-water, afterwards with cold water and with tepid water ; rub the part after drying for some time with the hands, and after wrap the part in wool. Do not let the patient go near the fire nor bathe the part in hot water.

In case of clothing catching fire, what should be done ?

At once wrap up the person whose clothes are alight in something—a table-cover, rug, or cloak—tightly, and roll him or her on the floor till the flames die out.

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Mention the varieties of fits, or seizures, you know of.

Fainting fits, or syncope.

Epileptic fits, or falling sickness.

Apoplectic fits.

Sunstroke.

Drunken fits. Hysteria.

Give briefly the distinguishing features of a case of fainting, of apoplexy, and of epilepsy.

*Fainting*.—Face pale, falls to the ground through failure of the heart's action.

*Apoplexy*.—Face flushed, pupils of eyes do not respond to light, but are fixed.

*Epilepsy*.—Face flushed, foaming at the mouth, body convulsed in violent jerks, patient often screams, grinds his teeth, pupils act to light.

Distinguish between a fit of sunstroke, drunkenness, and hysteria.

*Sunstroke*.—Pupils of eyes contracted, face flushed, quick pulse, noisy breathing.

*Drunkenness*.—Pupils dilated, face flushed, white of eyes often bloodshot and watery, smell of spirits in breath, helplessness, insensibility.

*Hysteria*.—Loud sobbing, cries and laughter, jerky movements of limbs, face often flushed, tears, pupils natural.

In the field, what are the more common kinds?

Fainting and sunstroke.

What is the first treatment in any kind of fit?

To loosen all tight articles of clothing—collars, belts, coats, and even boots; to allow fresh air to play about the sufferer, and to keep a crowd from gathering round.

What should you do in a fainting fit?

Let the case lie flat on the back with the head low, fan the face and sponge it with a little cold water; apply smelling salts, sal volatile, or liquid ammonia and water occasionally to the nostrils; when the patient recovers give a little water to drink, or sal volatile and water.

In sunstroke, what should be done?

Carry the case at once into the shade; raise well the

head and shoulders ; loosen all clothing, bare the chest ; sponge the head with cold water, and dash cold water over head and neck.

In apoplectic fits, are the above measures, or any of them, to be used ?

Certainly not, except to loosen his clothing and place him on his back, raising the head a little ; on no account interfere with the case ; send for the surgeon.

In a case of apparent drowning, how long should the movements of artificial respiration be kept up ?

From one to two hours.

How many times a minute should these movements be made ?

About fifteen times a minute.

Except by taking off wet clothes and wiping dry the body, should anything be done to restore warmth ?

Not until natural breathing has returned ; for should the circulation of the blood be induced by rubbing, &c. &c., before the return of breathing, the patient's life will be in danger.

In a case of poisoning, when you know that some corrosive fluid has been drunk, what should you do ?

Do not give an emetic. Make the patient swallow oil—olive, linseed, or cod-liver (not paraffin oil) ; if neither of these can be had, give milk, eggs beaten up, or flour and water.

If you know that a strong acid, say vitriol, spirits of salts, or nitric acid is the poison, what antidotes can you use ?

Mix either soda, potash, magnesia, lime, or ammonia in plenty of water, and give to drink. No emetics.

Or, if strong alkali, *e.g.*, ammonia, caustic soda, or potash?

Give vinegar and water, lemon-juice and water, tartaric acid and water. No emetics.

In a case of laudanum poisoning, or poisoning by opium?

Rouse the patient at any cost, shake him, shout at him, make him walk about. Give hot coffee till a medical man arrives.

Give an emetic; keep the patient moving and awake by every means in your power.

What are good and safe emetics?

A tablespoonful of mustard in a tumblerful of warm water; and half a small teaspoonful of white vitriol (zinc sulphate) dissolved in a pint or so of warm water.

In what cases of poisoning are emetics permissible?

In a case of opium or belladonna poisoning, or from berries or plants, but never when the poison swallowed is known to be an irritant, such as carbolic acid, oxalic acid; the strong fluid acids—vitriol, &c.,—or the strong fluid alkalies, *e.g.*, ammonia, caustic potash, or soda. If possible, always send for medical assistance.

When poisoning happens through the bite of an animal, snake, or poisoned arrow, what is the treatment?

To prevent the poison from entering the circulation by tightly tying a tape or band round the affected limb between the wound and the heart. Encourage the wound to bleed by bathing with hot water.

In snake-bites, the wound may be bathed with ammonia and water; stimulants freely given to the patient.

To cauterise one of these wounds is, although a common practice, of no use whatever.



PART II.

MANAGEMENT OF THE SICK.



# MANAGEMENT OF THE SICK.

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## CHAPTER I.

### BEARERS AS HOSPITAL ORDERLIES—ON THE MARCH, AND IN BILLETS.

ALTHOUGH there are regimental bearers both in the Regular as well as the Volunteer Service, in the volunteers—with the exception of the Volunteer Medical Staff Corps—the regimental bearer is the substitute for the hospital orderly of the regular army. It is almost a certainty, therefore, that, in addition to his ordinary duty as one of his regimental bearer section or detachment at field manœuvres, he will at some time or other be placed in nursing charge of sick men in extemporised field or brigade hospitals, the latter established in some town or village, the headquarters for the time being of the force mobilised.

By way of illustration, let us suppose that a column detrains at West Hoathley in Sussex, advancing by the ordinary high road to the village of Cuckfield, in and around which it will be billeted that night. In rear of each battalion, and never losing touch of it throughout the day's march, will be the regimental bearers with stretchers, and surgical haversack, and water bottles. In rear of the column, and between it and the rear guard, will march the ambulance and field hospital store wagons, the water carts, and general service wagons. More often than not there

may be no hospital tent equipment, but merely an ambulance wagon and a water cart.

For service with the wagon three bearers should be told off, one of whom will be a sergeant or corporal; these three will act as hospital orderlies under the surgeon in medical charge of the column who will be with the wagon throughout. The N. C. O. will have under his charge whatever medical stores and comforts (spirits or wine and essence for making beef tea) have been issued, will be responsible for having every article immediately at hand when called for, and to this end should, upon taking over the stores, not stow them away, as is often done, underneath greatcoats, spare stretchers, kit-bags, &c. &c., but instruct his two fellow-bearers as to the contents of each package, and have a special corner of the wagon for each. One man should sling over his shoulder the field companion, the other the water bottle, and the N. C. O. himself the surgical haversack.

With the wagon should be found four or six stretchers, folded up and slung in loops at either side. Two of these should be "prepared" and placed in readiness on the floor; there is supposed to be sufficient space still at the head and foot of each prepared stretcher for a man's valise, &c., and through the loops fixed at the sides of the wagon are to be slung the sick men's rifles.

In fine weather, in preparing the wagon, the curtains at its head and tail should be lashed back to admit as much light and air as possible; the hood also may be folded back, the tail-board pulled down by withdrawing its linch-pins, and the cushion and seat—a padded board with a back, which will be found inside the wagon—placed in position. The latter part of the preparation—adjusting the cushion, &c., and letting down the tail-board—should be practised upon taking over the wagon, that no delay may occur from jamming when it becomes necessary to admit a man on a stretcher, for on no account is the attempt to lift a laden stretcher over the back-board to be made. The N. C. O. will either



himself register the name, rank, corps, and nature of casualty of each patient brought to, or applying at, the wagons for treatment, or detail one of the bearers for this duty for instructional purposes. A model form of sick registration is given in the Appendix.

**Loading Wagons.**—Where Government wagons are used it will be necessary to shift patients from the stretchers upon which they are brought to those belonging to the wagon. This is a most reprehensible practice, and might lead to awkward complications on active service ; however, where regimental stretchers are in use it is unavoidable. The bearers from the front should halt and lower their stretchers not less than ten paces in rear of the wagon ; the wagon orderlies, upon sighting the approach of the stretcher party, must immediately prepare for the admission of the patient by removing the back-board and placing it on the ground outside the near hind-wheel and well out of the way of the feet of those approaching. Rifle and bayonet, valise and equipment, will be taken over before the patient has been admitted, and stowed away, as this causes less risk of injury to him ; the wagon stretcher will be withdrawn, when the surgeon gives the word, by one of the party from the front.

If only two bearers bring the sick man in, the wagon orderlies must assist them in transferring him from the regimental to the wagon stretcher, and the latter to the floor of the wagon. When four bearers come with the stretcher, the orderlies will better assist by keeping strictly up on the front seat out of the way of those lifting the stretcher, contenting themselves with easing and guiding in its foot from that point. I say the foot of the stretcher, for unless otherwise specially ordered, it is right to drive a sick man face to the wind, so that he may enjoy the restorative influence of a fresh current of air blowing through the wagon, and also because travelling head foremost in the recumbent position induces nausea.

The patient is now to be made as comfortable as may be. Under the surgeon's direction the orderlies will adjust the head and limbs, propping them up with the valise and other belongings, and spreading his great-coat over him; the back-board will be re-adjusted and the wagon move on. The name of the patient will be entered on the sick form, and during the rest of the march he must be kept under observation by one of the orderlies and his wants promptly attended to. Among the latter are likely to be an occasional drink of water, an extra covering, re-adjustment of extemporised pillows, closure of the wagon curtains, shading the eyes from the sun, besides administering restoratives and medicines. All these requirements, although apparently individually almost too trivial to mention, are, if unprovided for, likely to render the day's march one of considerable suffering to the patient; and due attention to them or the reverse will constitute an example of the difference between good and bad nursing.

The old pattern ambulance or "Mark I." wagon will accommodate two patients lying on stretchers on its floor, three on the front and hind seats sitting up; whilst the later or "Mark III." carries one less, as the driver, instead of riding the near horse, drives from the box. There is a more recent pattern still, closely resembling "Mark III.," only that the hind seat for three is dispensed with, two sitting up inside the wagon at the foot of the stretchers, and two on the driver's box; folding-up cushioned seats, like those of a wagonette, run round the inside, which will accommodate a number of men able to sit up when there are none compelled to lie down on the stretchers.

Upon arrival at billets for the night the sick should be made to remain in the wagon till the first bustle of taking over quarters has passed by. If billeting arrangements have been satisfactorily completed there will be no unnecessary delay in transferring the sick to the building used as a temporary hospital. In some cases the field hospital for the

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night will consist of a couple of bell tents, or even of the wagons themselves.

The bearer detachments on duty in advance of the wagons on the march should be awaiting their arrival, to render all assistance in transporting the sick to whatever shelter has been determined upon, to pitch the marquee or bell tents, or under the direction of a medical officer to prepare a building as a sick ward. The material available as ward furniture will, of course, vary considerably ; in some billets mattresses will be procurable with rugs and blankets, in others straw only, in yet others not even straw ; and the stretchers must be used as beds. Stretchers must invariably be used as beds for the sick in the following cases :—where the floor of the hospital consists of turf or earth, as in tents, huts, or barns, in outbuildings which show any signs of dampness, or in rooms with stone or concrete flooring, except, of course, where bedsteads are procurable.

Where no other shelter is available, two patients can be housed in the wagon, and two on stretchers under it ; the inventive genius of the bearers in such a case will be taxed to improvise a shelter wall or screen on the windward side or end of the wagon to keep off wind or rain from the sick. With Malet's shelter sheets this can be done without the least difficulty, but in the absence of those useful camping requisites, a rough curtain of straw rope plaited together will give some shelter, boughs of trees interlaced may form a screen, but straw heaped up, or bracken, should be avoided for fear of fire.

In arranging a room or outbuilding as a ward, the first thing to bear in mind is the comfort of the sick. Crowding together of mattresses or stretchers must be strictly avoided ; nothing will cause a sick man to pass a bad night more surely than overcrowding. The beds should not be arranged sideways, but at right angles to the wall ; heads to the wall, but about six inches clear of it ; feet to the middle line of



the room. Sufficient space to move about easily between and around the beds must be allowed, say not less than six feet interval. The bed nearest to the door should be occupied by the orderly off duty, and not by a patient. As a rule, in outbuildings, through cracks and chinks, will come a sufficiency of fresh air, but in house rooms ventilation must be procured by leaving the upper sash of the window a few inches down constantly. Means of boiling a kettle at any hour of the night must be provided ; if there be no fire-place and no spirit lamp or stove, an extempore fireplace must be built outside.

Upon the arrival of patients, their arms and accoutrements are to be collected and piled or stacked in a corner near the entrance, but at the same time entirely out of the way of anyone walking about the ward. Each valise and kit-bag is to be placed at the head and foot of their owner's bed respectively ready for unpacking. Whether, and which, patients are to be undressed will depend upon the orders issued by the medical officer in command, each case will have special directions issued for it ; for instance, it may be ordered that case No. 6 or No. 7, perhaps a fractured tibia, is not to have his trousers removed, but only his tunic and the boot from off the sound leg ; and that No. 9, a case of apoplexy, is to have only his trousers and boots off. All cases which may be disturbed without harm will have their day changed for sleeping clothes, not only as a matter of comfort, though in nursing a patient's comfort must in the minutest particular be studied, but as an ordinary measure for the preservation of health and cleanliness,—health and cleanliness being inseparable. Special arrangements will have to be made for those too helpless to wash themselves or to walk to the latrine ; and by the time these matters have been attended to the evening rations will have probably arrived for distribution. Of course the more severe cases will receive the first attention at the hands of the orderlies, and the minor ones must wait ; the more trivial should be given something



to occupy their time,—for instance, a man with a raw heel, though he cannot march, when his boot is removed can hobble to the lavatory and wash his foot, and that done can unpack his kit bag and make his own bed, and can do the like for another sick man who may have injured his hand or arm.

After the food distribution will come the application of dressings and bandages by the medical officer, assisted by the orderlies ; special instructions in particular cases will be received, and orders for the night, and, if the column is to move on in the morning, special instructions for the early morning. After this routine there may still be much for the orderlies to do, for, as stated above, there may be sick men so helpless as to be unable to wait on themselves, and these must be waited on. The most common service required of the orderlies will be,—washing and feeding the helpless cases, and, at stated hours in the night, applying certain remedies and giving medicines. Where there are serious cases of sickness requiring it, each orderly will have to take a spell of duty as night nurse ; or if there are enough bearers two will be on duty together, always a preferable plan as one can keep the other awake. The preparation of simple sick diet such as night orderlies have to prepare, and the further consideration of attendance on the sick, will be touched upon more fully in subsequent chapters.

## CHAPTER II.

### THE REGIMENTAL BEARER SECTION IN THE FIELD — THE AMBULANCE ARRANGEMENTS FOR A DIVISION IN THE FIELD.

IN ordinary travelling by route march, the bearer section will march a few paces in rear of the rear company of its battalion, not in rear of the rear guard—a stretcher detachment or two, according to its strength, having previously marched off with the advance guard; where a whole battalion forms the guard, the whole section will march with it. To keep in touch with their corps, or portion of it, is the first duty of the bearer section; and when the battalion advances across the open in attack formation the section is to be well up with the line, extending its detachments right and left, one detachment to each two companies. If half the battalion is ordered forward to skirmish, two or three detachments must advance with it.

Invariably, in advancing across the open in attack formation, or when the force may be supposed to be within rifle range of an opposing force, are the stretcher detachments to open out at intervals of at least four paces—not only between stretcher and stretcher, but also between man and man (this last refers of course to those not actually carrying stretchers)—stretchers folded up to facilitate carriage at the double, and carried with the poles parallel to the line advancing in front of them. At each halt, the stretcher parties will lie down, as it is the duty of each individual bearer to expose himself as little as possible

under fire, if he is to be of subsequent use to the wounded in an action. These directions may appear to be needlessly minute ; but as all manœuvres are, or should be, instructional, when men parade as regimental bearers they should invariably carry out their duties in peace manœuvres with the same exactitude as would be compulsory in war.

The instant a man drops a stretcher party will hurry up, ascertain what is the matter, and proceed to attend to his injury. The wound dressed, or fracture set, he is at once to be carried to the rear ; or, if he be not incapacitated from walking, he may be left awhile on the ground, as the party can be of more use by hurrying on again to attend to more serious cases. In the matter of carrying disabled men to the rear, the rule is that regimental bearers are to carry only for short distances—theoretically, only at most a few hundred yards to the nearest **collecting station**, which will be established within easy distance ; and moreover, theoretically, they will be met about half-way to the collecting station by stretcher parties sent out from thence, to whom the regimental bearers will hand over the injured, and hasten back again to the fighting line. That is what should happen.

The essentials of a collecting station (*see* Fig. 39) are that it shall be within easy reach of the field of battle, and should be well protected from the rifle and gun fire of the enemy. It is obvious that in many instances these conditions are by no means easily secured ; their fulfilment will depend entirely upon the nature and configuration of the ground traversed by the advancing lines. Broadly speaking, what is required is shelter ; this may be afforded by a dip in the ground, by a hill, by buildings, or by a wood, or copse ; and bearing in mind the old proverb, “out of sight out of mind,” the spot chosen should be out of sight ; tents and white wagon-covers, if seen by the other side, will of course be made targets of.

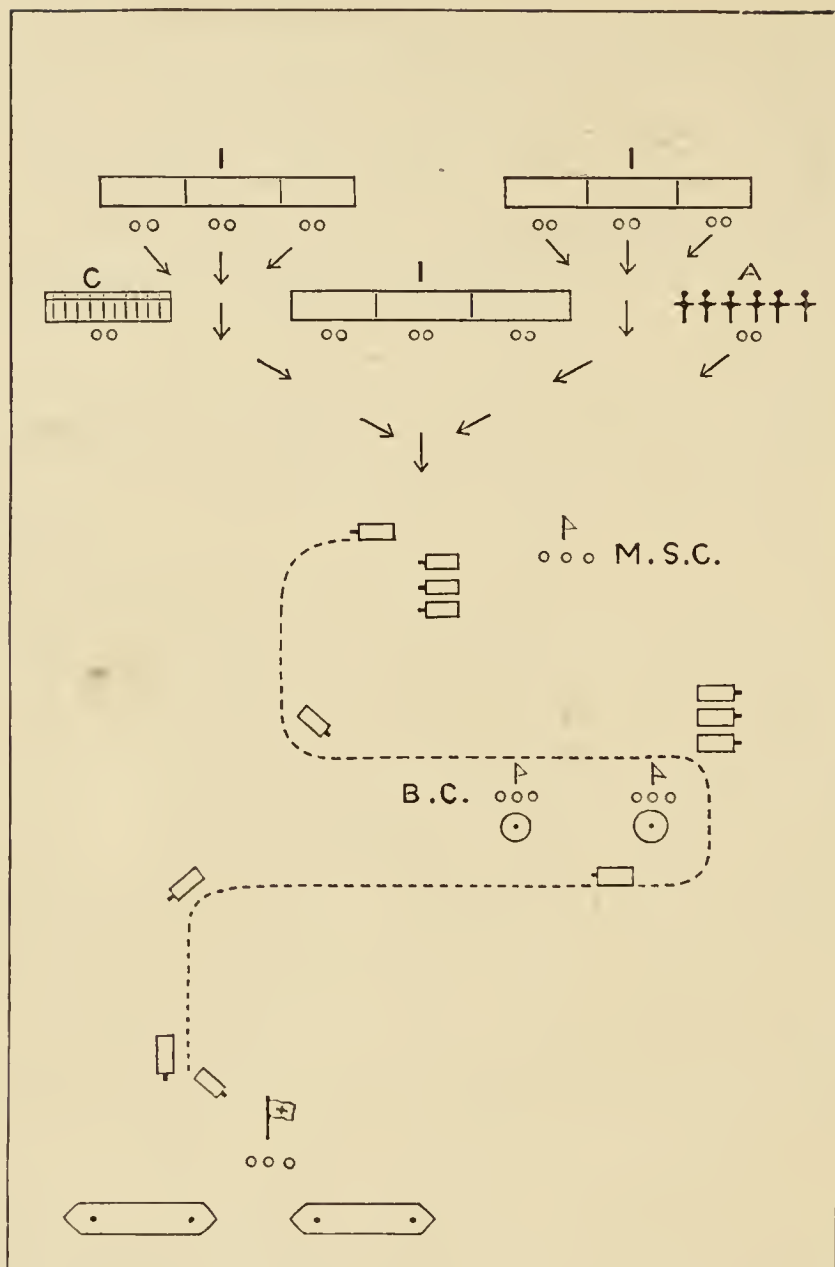


FIG. 39.—Plan of the ambulance arrangements for a division in the field.

I I I, Infantry Brigades. C, Cavalry. A, Artillery.

oo oo oo, Regimental bearers with fighting line.

ooo M.S.C., Medical Staff Corps bearers, of the bearer company at collecting station.

B.C. ooo, Medical Staff Corps, dressing station.

Dotted line with oblong blocks—wagons transporting wounded from collecting station, through dressing station, to divisional field hospital in rear.

Arrow heads—regimental bearers carrying wounded from immediate rear of fighting line to Medical Staff Corps bearer company's collecting station.

ooo and square flag—Medical Staff Corps field hospital in rear.



At a collecting station it is not usual to pitch any hospital tents; it is really only a rendezvous for the bearers of the bearer company carrying in the wounded, which they have taken over from the regimental bearers, and where they will find the wagons to carry the patients to the **dressing station**, half a mile or more to the rear, easy of access to wheeled transport, and well under shelter (Fig. 39).

Nothing further then is done at the collecting stations than I have indicated, namely, loading and starting off the wagons, administering medical comforts to those urgently requiring it, re-securing any First Aid dressings which may have become shifted in the process of stretcher transport from the front, and issuing fresh supplies of dressings and bandages to the bearers who are about to return to pick up more disabled men. If available there will be a surgeon at the collecting station with a small staff of orderlies to superintend the loading of the wagons, but no operations of any magnitude will be done there, the prime object being to pass the dangerously wounded as quickly to the rear as possible.

The **dressing station** is a collection of wagons and a surgery tent or tents,—that is, if no farmhouse or suitable building is at hand which may serve as a substitute,—half a mile to a mile in rear of the collecting station, a spot having been selected easy of access for the wagons from the front, and having also good lines of communication with the **field hospital**, two miles to the rear (Fig. 39).

At the dressing station the more seriously wounded are removed from the wagons and re-examined by the surgeons on duty, and any operation imperatively necessary done,—for instance, the ligature of some important blood vessel bleeding from which has only been temporarily arrested at the collecting station or on the field; a very serious case will be detained here, and restoratives administered should it be thought that the journey to the field hospital might

prove fatal if immediately persisted in ; all the cases arriving from the collecting station will be re-examined to ascertain the condition of their dressings, to select those cases which may be at once forwarded to the hospital without danger, and to transfer those which may bear it to other means of transport, such as vehicles other than ambulance wagons requisitioned for the service, or in mountain and desert warfare, to mule-litters, or mule-chairs (cacolets).

In an army corps these three points in rear of the fighting line (*a*) the collecting station ; (*b*) the dressing station ; and (*c*) the field hospital, will be in charge of the medical officers and orderlies of the Medical Staff Corps. The Medical Staff Corps of our army is comparatively a small department with limited resources, and in any great action it is evident that the bearer companies allotted to each division would, in point of numbers, be unable to attend to and carry in the large number of wounded.

The number of Medical Staff Corps bearer companies for a division is two ; remembering that division means two or more brigades of foot with cavalry, artillery, and departmental troops attached, and that even a small infantry brigade will total from 1600 to 2000 bayonets ; and further, when I state that the strength of a bearer company is three officers and sixty-one men only,—it will be seen that upon certain occasions the disabled would be likely to fare badly unless some further provision were available for their needs. This want will now be supplied by the various regiments engaged in the operations themselves. For some years as an auxilliary to the bearers of the Medical Staff Corps companies, each regiment has had a detachment made up of two men from each company specially trained in ambulance knowledge, and stretcher drill. Upon the commencement of hostilities, these men fall out of the company ranks, assemble, and form the regimental bearer section.

Upon the regimental bearer, therefore, will devolve duties of great responsibility, involving great presence of mind, and an utter disregard of personal danger; he will have to keep moving forward with his regiment not at a conveniently safe distance in rear, but in touch with the fighting line itself.

## CHAPTER III.

### EQUIPMENT.

THE Manual for the Medical Staff Corps, in one of its few references to regimental bearers, directs that they should "leave their rifles and valises in the company carts, take their stretchers, and proceed to the scene of action."

In the volunteer service company carts as yet exist here and there only as a curiosity, transport of any sort being in its infancy, and the bearers must depend upon themselves almost entirely for the carriage of stretchers; this is a monotonous as well as fatiguing duty, and the only method of lightening it which suggests itself is to have a relay of bearers as a relief party, so that those carrying the stretchers may have short spells. Here again another difficulty presents itself for to have double the usual number of men in the bearer section is undesirable and unnecessary, except as a relief, and is a practice scarcely likely to obtain the sanction of colonels, who naturally object to the thinning of company ranks.

Without the cart alluded to above, or its equivalent, it is obvious that our bearers cannot parade with rifles, and it is extremely doubtful whether in heavy marching order they would be efficient ambulance men. Equipment, of course, varies in different corps, but in the light of recent events it may be taken for granted that each volunteer will carry a greatcoat, valise of some description, mackintosh sheet, and mess-tin, besides two ammunition pouches, haversack, and water-bottle, arms, and entrenching tools.



It may prove of interest here to state the weight of articles of equipment usually carried, which are given by Lord Wolseley in his "Soldiers' Pocket-Book," a work so replete with information, and so full of details which can have any bearing upon the life and well-being of those engaged in military duties, that no volunteer should fail to read and study it :—

Greatcoat,	.	.	.	4 lb. 12 oz.
Valise (empty),	.	.	.	3 lb.
Accoutrements,	.	.	.	4 lb.
				<hr/>
				11 lb. 12 oz.

The weight of arms (10 lb. 9 oz), and of ammunition, and entrenching tools I omit in this estimate, as also the exact weights of food and water, haversack, and bottle, the average weight of the latter articles and rations amounting probably to 7 lb. extra, clothes in valise about 5 lb., will give us a total of about 26 lb. to be carried by each bearer in addition to the clothes in wear.

None of these articles could be dispensed with on service. What then is to be done? Are regimental bearers to become a species of beasts of burden? It seems something like it. There are one or two suggestions I here make which have been brought into use with those under my command, and which, if adopted, may render the burden of stretcher-carrying slightly less fatiguing.

Much irksomeness may be avoided by a disposition of the kit about the body slightly differing from the manner ordinarily in use. For this alteration, of course, special sanction from the officer commanding will have to be obtained.

(a) When parading without valises or coats all pouches should be worn on the front of the belt instead of, as is frequently the custom, behind. If only one pouch is worn, this should be passed round to the right front of the waist-belt. The same rule applies to the water-bottle, this also

should be slung so as to hang just over the hip in front. With one pattern of bottle there can be no difficulty in this, as in lieu of a sling it is provided with a flat hook to fasten on the waist-belt.

The greatcoat must be rolled into a bolster shape and carried high up on the shoulders above the valise. To facilitate this, the valise may be lowered two inches on the back; and as it is unlikely that the exact army pattern valise will be adopted by most corps, a smaller valise bag or valise satchel being quite capacious enough to hold a volunteer's requisites, this arrangement will ensure that nothing shall hang behind below the belt. Every article of equipment, however small, worn behind directly interferes with the acts of lifting or lowering prepared stretchers, those I have mentioned especially so; the haversack and bayonet there is no help for, they must be worn as usual.

(b) A shoulder-belt of leather 2 inches wide, provided with tongue and buckle, and of about the same stoutness as the stretcher sling, may be worn across the left shoulder. Sliding on this is a metal runner, attached to which by means of a swivel is a second runner of the same size, through this latter passes a leather strap stitched into a loop; the handles of the folded stretcher are passed through this on the march. By this simple contrivance much fatigue to arms and wrists can be saved; and by means of the tongue and buckle the length of the belt can be adjusted to suit the height of each individual bearer.

(c) In the Appendix is figured a bearers' hand-cart which I have designed for the carriage of stretchers and *material* belonging to a regimental bearer section; an ordinary stretcher, when prepared and placed resting on the crutches, forms a litter. As it is of light construction and capable of being quickly taken to pieces and as quickly put together again, it may be taken across country where a horsed carriage could not be; and where no company carts are available, the bearers' valises can be carried on this cart.

Now a few words as to personal equipment. In addition to the usual companion, or portable medicine chest, each section is presumed to be provided with, each stretcher detachment should have a surgical haversack and large water-bottle. The regulation field medical companion contains an extensive assortment of drugs, medical and surgical stores, and a dressing-case; the haversack contains requisites in constant use, such as sal volatile, medicine cup, lint, bandages, cotton-wool, plaster, and sponges, also light arm splints, tourniquets, candle and matches, and simple dressing instruments. But over and above these, each bearer should have a separate supply of dressing materials carried about the person, as is the custom in the Medical Staff Corps in the field.

When old-fashioned prejudice in favour of smartness shall have given place to utility in military tailoring, we may hope to see tunics made with useful breast pockets; but at present dressing materials must be stowed away in the limited capacity of an ordinary cartridge pouch. The Lintott pouch may hold with careful packing the following:—2 triangular and 2 roller arm bandages, some lint cut into narrow strips and small squares, some cotton-wool, self-adhesive plaster, a flat tin of ointment, a bit of sponge, some tape, threaded sewing-needles, scissors in case, a smooth pebble for an improvised tourniquet pad, and a small phial of sal volatile. Additional lint and bandages may be stuffed into the breast of the tunic. Armed with these requisites, the bearer is to a certain extent independent of the surgical haversack and companion in case he becomes separated from the rest of his party.

In his own haversack, in addition to his tin plate and knife and fork and spoon, he should carry a small flask-shaped drinking-cup of metal furnished with a lip or short spout; this will be found of great service in administering water or restoratives to the sick. Canteens are now made of the regulation pattern, fitted with a number of miniature

table requisites, the selection of the fittings for one of these may safely be left to each man himself. The drinking-cup should never be left behind, as any man who falls out and requires assistance is sure to ask for water, having most probably exhausted his own supply; the use of the cup economises the water, only a very moderate supply of which is it possible for the bearers to carry.



## CHAPTER IV.

### NURSING — ORDERLIES' DUTIES IN HOSPITAL — TENDING HELPLESS PATIENTS — BEDSIDE NURSING IN SPECIAL CASES.

IN camp, bearers acting as hospital nurses will have almost identical duties to perform as in billets. As a training camp is seldom established for less than seven days, the hospital arrangements will be more complete, and will have less of that makeshift character inseparable from them when a force is moving from point to point changing billets daily. Bedsteads, sheets, and bedding will be found ; also hospital furniture and appliances of common daily use in permanent hospitals. Under canvas the sick will be concentrated in one set of bell tents or a couple of marquees ; in the case of mobilisation of a brigade in a town of size sufficient to offer the choice of a suitable building, such as a large well-ventilated schoolroom or hall, special instructions will be issued by the principal medical officer of the brigade, and the institution of a central brigade hospital will no doubt be a feature of the training.

In towns the hospital furniture and accessories will be even more complete than in camps, as there can scarcely be any difficulty in obtaining the requisite supplies, and the extemporised ward can be fitted with every comfort. In an instance of this kind there will be duty at the brigade hospital as well as regimental duty for the bearers, the regimental duty consisting chiefly of visiting detachments in outlying billets, treating trivial cases on the spot, and

reporting those unfit for parade to the hospital sergeant, who will prepare a written report for the regimental surgeon ; others of the section will be in orders for a day's duty at the hospital, and these duties will be those of **dressers and nurses.**

To become an adept in the art of attendance on the sick requires a lengthy apprenticeship, and I trust no reader of this chapter will imagine that by the mastery of its contents he may consider himself a finished nurse. My object is rather, by a few simple hints and instructions, to place it within the power of any bearer who really takes an interest in his ambulance duties, to make himself so far conversant with the elementary principles of nursing, that he may be useful if called upon to take charge of a sick comrade or two, and may be able to carry out intelligently the directions issued by the medical officer.

**Nursing**, so far as the regimental bearer is concerned, will embrace attending to such as are unable to march when troops are on the way from one point to another, and tending the wounded and sick in camp or in billets. This tending the sick will mean not only dressing wounds, but in most instances doing for the patients almost everything that in a state of health they could do for themselves—namely, washing, feeding, administering medicines, cooking (in some cases), making beds, cleaning, and general supervision.

A man brought into hospital will be sufficiently ill to necessitate careful watching, and will in most cases be incapable of doing anything for himself. He will probably have been seen by the surgeon, who will have ordered him straight to bed. As above mentioned, the camp hospital may be a marquee, but will more probably consist of two or more bell tents, each holding two, or perhaps three, beds. These beds may be mattresses and camp bedsteads, or ordinary stretchers with a little straw, if available, or as a substitute, dried heather.

The bearers told off for duty will be responsible that the tents are in a state of preparedness for the reception of patients. Leaving a clear gangway at the door of the tent, two beds will be ranged against its sides opposite the entrance, in the form of an inverted letter **V**; the pillows should be arranged at the ends farthest from the door, a blanket folded over each stretcher or bedstead, so as to leave no portion trailing on the ground, and a second blanket folded up neatly at the head. Pillows have been mentioned; in a standing camp they should be amongst the hospital stores (possibly sheets also), but in many cases they must be improvised by rolling a greatcoat and cape into a bolster, or by stuffing a valise with straw or heather. The upper blankets are to be kept folded up and spread over only when the sick have been undressed and put into bed.

The floor of the tent will require considerable attention where it is not boarded over. It must be carefully swept out the first thing, any scraps of paper, rags, dead leaves or flowers, or straw being entirely removed; and if of mould it should be well beaten down with the flat of a spade. In the case of a boarded tent the flooring must be taken up twice a week at least, and the ground underneath thoroughly swept out. No liquids of any kind should touch the floor, and spitting or emptying of slop or dish water must be rigorously prohibited. Outside all round the tent should be dug a shallow trench, about four inches in depth, the width of the spade, with an outlet leading away to carry off rain water; every morning this trench must be swept out, as in it *débris* is likely to collect and decompose, giving off offensive gases which may breed fever in the occupants. When the weather permits the curtains and door-flap are to be left open to obtain the full benefit of the fresh air, little enough of which finds its way into a bell tent at any time. A supply of water must next be procured, the drinking filter, if there be one, filled, and any utensils, such as basins, cans,



porringers, &c., arranged on a table or box serving as such as far away from the entrance as possible. When stretchers only are available as bedsteads, mackintosh sheets should be spread under them.

Upon the arrival of a patient, his kit-bag and arms will be taken over; rifle and bayonet braced to the tent-pole, belts and pouches, &c., hanging from them; the greatcoat, if necessary, converted into a bolster; kit-bag opened and the sleeping things taken out.

To undress him expeditiously, take off tunic and shirts before placing him in his bed, and slip his sleeping flannel over his head; he may then be placed lying down, his boots removed, then the trousers, socks next, lastly his drawers; these should at once be replaced by his sleeping trousers, and, without delay, the upper blanket of the bed, lying folded in readiness, spread over and tucked around him, and the pillow adjusted. Where sheets are available, spread one over the under blanket before lifting in your man, a second over him when undressed, and lastly the upper blanket. If the man shows signs of being cold—shivering and with chattering teeth—spread more blankets, or a greatcoat over him.

**Helpless Patients**, except in cases of fracture of leg or thigh, may be lifted into or out of bed by two attendants. This method is to be used only to transport a patient the very shortest distance, say a couple of yards only, or from one bed into the next; it is **not** to be adopted in any other instance.

*To lift*, let one bearer, R, stand on the right, and the second, L, on the left of the patient, close up to him. If necessary, let them stoop down and kneel, R on his right, L on his left knee. Let R next pass his left hand and arm under and straight across the patient's shoulder-blades, till his fingers reach the sick man's left armpit, here turning his hand and wrist upwards, let him firmly grip the chest. L, having given R time to do this, will pass his right arm also



straight across the patient's back, immediately below R's arm, turning his hand and wrist upwards as soon as they have travelled across the patient's back, and taking a firm hold of his chest. With their disengaged arms they will grasp the thighs ; R passing his right arm under the patient's two limbs, just below the buttocks, across to the sick man's left thigh, pushing his hand under this and turning it upwards, so as to grasp it well, making a bed for the thighs of his forearm and wrist. From the left side L will do the like, but with his left arm, wrist, and hand, passing them under after R, and just below and clear of him. With some such warning as "Ready?" "Yes;" "Together, then," R and L rise slowly, remembering that they are to work together, and that the success or the reverse of the process depends upon, first, having secured a certain grip, and next, acting together slowly and steadily.

In this instruction, the bed or spot to which the man is going to be lifted is close at hand. Having risen, supporting him between them, R and L must move in the direction of the bed, and in a small tent this is not such an extremely simple matter. They have to steer for the foot of the bed, avoiding a collision with the tent-pole on their way. The movement towards the bed is most safely carried out by means of side steps, so many to the right or left as the case may be, until reaching clear of its foot ; by a retiring movement, then, on the part of R, L advancing (or *vice versa*), the bed is brought into line with the patient's body, and by side steps advancing in the direction of the pillows, R and L stooping somewhat to give themselves plenty of space, bring the bed clear of their shins full length under the man.

He may now be lowered, *not dropped*, R and L acting in perfect accord, and on no account relaxing their hold of him till their own arms rest fully on the bed. One after the other, first from the thighs, next from the back, their arms may be withdrawn.

In a case of a fracture of the leg, a third attendant will be needed to support the injured limb, and two attendants alone should not attempt the lifting.

When a fracture of the femur, or thigh bone, has to be lifted, the most simple method is to edge a rug or blanket under the body, rolling its side borders tightly from above downwards over two poles, pitchforks, or rifles with bayonets (and scabbards) fixed. This rolling the blanket over must be tightly and evenly done by four pairs of hands working together, all the hands tightly gripping the blanket rolls and poles at the four ends and the middles. In taking side or other steps whilst lifting, the cardinal rule of breaking step must invariably be observed; and in no case must a fracture of a lower limb be lifted *unless some splint has first been applied*.

These methods of lifting and laying helpless men in hospital may, with advantage, be made the subject of practical teaching at the hands of the regimental surgeon, with dummy wounded; for it would be unfair to expect bearers to do this lifting with only the practice acquired at stretcher drill.

When the patient has been safely placed in bed the orderlies will carry out the special directions given for each case by the medical officer. These will to a certain extent be in writing — ordering food, drinks, and medicines, to be given at stated intervals; the application of external remedies, such as blisters, poultices, and hot foot-baths; or the covering of parts with fomentations or lotions; or the rubbing in of liniments or ointments. In addition to these offices about the sick-bed, the orderlies will be expected to note any change in the appearance of the patients, such as —whiteness of the lips and face, sudden redness or flushing, contortion of the features or jerking of the limbs, undue coldness of the body, shiverings, fainting, moaning, tossing about and restlessness, gasping for breath, excessive cough, unusual thirstiness,—and report them to the surgeon.

**Sudden Changes** denote serious constitutional disturbances, and will need special and prompt report. Those most likely to occur will now be considered.

**Fainting or Syncope** is characterised by blanching of the lips and cheeks and whole of the face, the latter breaking out into a sweat; the mouth remains half open and also the eyes. The pulse at the wrist can be felt beating feebly, and the breathing can also be heard, though but faintly. These symptoms may continue only a few seconds, or in severe attacks some minutes, the return to consciousness being ushered in by a few short sighs, movement of the eyelids, gradually returning colour to the cheeks and lips, longer sighs, movements of the lips and moistening them with the tongue, until finally the natural breathing is restored. In the severer forms the hands and feet are cold.

*Treatment.*—As fainting is the result of bloodlessness of the brain, due to enfeebled action of the heart, which, from some cause, is only able in an imperfect manner to pump up into the brain its usual supply of blood, the proper treatment is to assist the heart by lowering the patient's head, literally that the heart may have as little up-hill work to do as possible, and at once to loosen any garment or portion of clothing which may encircle too tightly any part of the body, lest these should offer any obstruction to the general flow of blood through the system, for example, a shirt collar, waistband, wristband, garter, shoe-string, waistcoat, &c.; next to provide a free current of cold fresh air, to blow over and revive the patient (fanning will often have to be resorted to), administering a gentle shock by sprinkling cold water over the face and chest, slapping the palms of the hands, chafing the feet, and the occasional application of weak ammonia and water, or smelling salts, to the nose.

**Fainting** may be caused by loss of blood, excessive pain, fright, want of food, exhaustion from fatigue or disease. Examples of syncope from unwonted fatigue are



common enough in the volunteer service, and in camp are sometimes known as accompanying severe attacks of diarrhoea. After recovering from an ordinary fainting fit give the patient half a wineglassful of water, to which may be added about twenty drops of sal volatile. In more severe cases, where the fainting fit lasts longer, when the patient regains consciousness a hot water bottle should be placed in the bed at his feet, and a little warm beef-tea prepared, to which may be added two teaspoonfuls of brandy or whisky, and administered as early as possible. The mistake of trying to make a sick man swallow whilst he is unconscious, or when he has only half come to, should never be made, as it has resulted in choking and death.

**Collapse or Shock.**—A man may be brought to the hospital with the following history:—he has been found lying down somewhere apparently with little life in him and incapable of sitting up; or he has had a severe fall; or has been knocked down and run over by a cart or horse.

When brought in he will be unable to stand, will not even sit up without support, and will want to lie down. He may be shivering, his face and lips will be white, hands and feet cold, the pulse can scarcely be felt, and the breathing will be noticeably faint, and if spoken to it will be with an evident effort that he can rouse himself, so drowsy is he.

The appearances are serious, and in the absence of the surgeon the orderlies in charge must begin the treatment.

The first thing to be done in a case of shock is to get the patient warm. The body is cold through feebleness of the circulation, therefore artificial warmth must be provided. As in fainting anything tight must be loosened in the clothing, and the man must be wrapped in blankets. Hot water bottles or tins must be placed inside the blankets to the feet, and between the thighs. Although it will cause a few minutes' delay, it is better to remove first the boots, trousers, and tunic. Lay the patient flat, with the head



low. Rouse him very gently, and give sal volatile and water, and as soon as it can be prepared small doses of beef-tea and wine, or spirits, being especially careful to raise the head and shoulders before letting him attempt to swallow. Watch the case carefully ; if the body does not get warm, additional hot water tins must be placed around it, more restorative given. If the urine and motions are passed unconsciously it is a very grave sign, and must be reported without delay. Should the respiration become shallow and infrequent, and continue so in spite of what has been done, artificial respiration (*see Drowning*) may be necessary—but only under the surgeon's supervision—till the natural breathing returns, the feet and legs must be rubbed with the hand, and a mustard blister may be applied over the heart. Vomiting indicates returning consciousness.

**Sunstroke and Apoplexy.**—In either of these cases the man when brought in will be quite unconscious.

**Sunstroke** is caused by an interference with the natural functions of evaporation and radiation of the skin ; the blood becomes much over-heated, producing depression of the nerve centres.

It is a casualty known only in hot weather, and is not uncommon in summer camps. A man unaccustomed to much exertion, whose health is lowered by breathing impure air, or by improper living, parades with his corps for a long field day ; he is under arms many hours, each previous day having been sunny and hot ; he becomes giddy, and falls unconscious, but does not come to as in an ordinary fainting fit. He is brought into hospital and his appearance is as follows :—

The skin is excessively hot, the head and neck especially ; the face and neck are flushed, often the whites of the eyes also ; the temples and sides of the throat throb ; the pulse is hurried and feeble ; the breathing may be either hurried, slow and laborious, sighing, or snoring, with puffing out of the cheeks in expiration. There may be convulsions.

*Treatment.*—The man must be placed lying down, with the head and shoulders raised, in the coolest and darkest part of the tent. All clothing must be loosened ; nothing tight must be left on the body ; the throat, head, and chest must be fully exposed to the air, and if but little air is stirring, an artificial current by fanning must be constantly kept up. It will facilitate matters if the patient's shirts be taken off. Place him on the floor of the tent, propping up the head and shoulders ; arrange a mackintosh sheet so as to protect his abdomen and legs, and then persistently douche—or throw cold water over—his head, neck, and chest. A cupful at a time is sufficient, thrown at intervals of three or four minutes. If ice can be had, break it up in small knobs, tie these into a handkerchief or triangular bandage and rest the package on the patient's head. Persist in this treatment till it is noticed that the breathing improves and the pulse becomes calmer, then the douching may be stopped, the patient rubbed dry, and if the excessive heat of the body has sensibly diminished, a light flannel may be thrown over him. The ice to the head and the fanning must be kept up. On no account attempt to give stimulants of any description ; to moisten the lips with a wet cloth is all that the orderly may do. Any attempt to make the patient swallow even a teaspoonful of fluid may end fatally.

**Apoplexy** is produced by the rupture of some blood vessel within, or upon, the brain, the blood thus escaping pressing upon that vital organ and interfering with its functions, producing more or less derangement of the other organs of the body. This compression of the brain may be also produced by the rupture of an abscess in the skull cavity, or by a fall or blow of sufficient intensity to drive in any part of the cranium, and cause pressure upon the brain substance.

Apoplexy (except that caused by injury) usually occurs in stout, bull-necked, full-blooded subjects, who are elderly and unhealthy.

We have many likely subjects of apoplexy in the ranks of our volunteer army, who may live to a green old age whilst pursuing the even tenour of their way in the tranquility of their ordinary civil life, but who may suddenly succumb in the midst of some unwonted exercise or effort, a little too much hurrying in skirmishing up-hill, or over excitement in rapidly serving a gun, for instance.

On admission, the face is red, and the veins of the forehead are usually prominent; you learn, perhaps, that the man has been bleeding at the nose at various times lately, was feeling out of sorts the day before, and that after falling down on parade they could not rouse him.

As in sunstroke, his face is flushed and his breathing may be snoring with puffing out of the checks, and he may have a feeble pulse; but, unlike sunstroke, though the face be flushed, the body is cold, the pupils of the eyes will be open, there will not be any excessive heat of the head and neck, the breathing, though snoring and puffing, will never be hurried, but, on the contrary, nearly always slow and laboured; the face may be of a peculiar dark colour, there will be a slow throbbing of the pulse at the wrist and in the arteries of the temple and throat. If the whites of the eyes be touched there will be either no flinching, or hardly any; helplessness (paralysis) of the limbs will be very apparent, urine and motions (from paralysis) may be passed under the sick man.

*Treatment.*—Place your patient on his back on a bed, raise his head and shoulders, remove all constricting clothing, keep the feet warm, give him plenty of air. Sponge the forehead with cold water, or, if you can procure it, place ice to the head.

On no account shake or shout at him, or try to give him drink; this is eminently the class of case where the over-zealous attendant may cause an irreparable amount of harm to the patient by amateur doctoring, and in which, beyond performing the few simple offices I have described for



the comfort of the sick man, the golden rule is not to disturb him.

**Delirium** means a temporary derangement of the brain, which shows itself in the incoherent and hysterical speech of the patient, and in his delusions, extraordinary conduct, and often violence.

The causes of delirium are many and various, but it will be sufficient here to mention the following :—excitement, melancholy, shock and fright, prolonged and excessive pain, fever, and excessive indulgence in alcohol, either alone, or combined with some of the other causes.

*The treatment* consists in preventing the patient from doing violence to himself or to others if he is inclined to be violent; being firm, whilst at the same time appearing to humour him, never aggravating his condition by contradicting his assertions, but governing him by persuasion in the fullest sense of the word. Delirious patients are often most troublesome at night, and the orderlies on duty will have to keep well awake to prevent the sick man from leaving his bed and breaking out of hospital. Any weapon, or instrument which he might use as such, must be out of his sight and reach, the lamplight should be shaded from his eyes, and quiet and silence strictly maintained; sleep is the sovereign restorative in this class of case, and the orderlies must carry out to the letter the instructions given for the treatment of the case by the medical officer; drink, food, and medicine being regularly administered, ice applied, &c. &c. The administration of either food or medicine is often an impossible task should the patient be in a refractory humour; it is better if this be the case at the hours when it is ordered that medicines be given, to give up the attempt for a while and make further attempts when the man is calmer. In nursing cases of delirium, some of the highest qualities of the hospital attendant are called for, namely, vigilance, discretion, and the utmost patience.



**Colic and Diarrhœa** are both of frequent occurrence in camps, the former from undigested food, and the latter from exposure, unaccustomed change to camp diet, and very often from drinking impure water.

In colic, the man admitted will complain of excruciating pain in the centre of the abdomen; in *diarrhœa*, though often griping pain is complained of, it does not last so long, and there is frequent desire to pass motions.

The system may be so lowered by either of these affections that the patients will have to be put to bed, and if the surgeon is not at hand, the following treatment may be commenced:—

*In Colic*, get the patient to bed, procure boiling water and apply hot fomentations (*see* Chapter V.) to the abdomen, direct the patient to draw up the knees, and arrange a pillow or other support under them. If the patient is cold apply a hot bottle to his feet. If the medical officer has sanctioned the administration of medicine, 10 drops of chlorodyne may be given in a little warm water.

*In Diarrhœa*, a dose of diarrhœa mixture—which will almost invariably be amongst the camp hospital stores—should be given to the applicant; if the diarrhœa be accompanied by griping, five drops of chlorodyne may be added, and if the patient is very faint, twenty drops of sal volatile also. The most troublesome symptom will be the constant desire to pass motions, and this in an extempore hospital will cause much inconvenience from the absence of closet accommodation. As the sick man's malady renders his presence offensive to other patients, the medical officer will probably make arrangements to have the severe diarrhœa cases in a separate tent or room. In an organised camp hospital no doubt earth closets, or night-stools of some description, will form part of the stores. In very acute cases the patient must use a bed-pan, but he should be made to get up if possible, and where it is necessary to extemporise a night-stool, an ordinary galvanized iron bucket

may be used, which should be padded round the edge with towels, and contain water to the depth of 3 or 4 inches, in which some disinfectant has been mixed ; the sick man may be given a small quantity of cold water in a bowl and a pledget of cotton wool to use after each motion, and as soon as he has returned to bed, the pail containing the cotton wool and bowel discharge is to be instantly taken away and emptied into the special hospital latrine, the pail washed out, prepared again, and placed in the tent for further use.

## CHAPTER V.

BEDSIDE OBSERVATION—THE TEMPERATURE, PULSE, AND RESPIRATION — BLEEDING FROM NOSE, LUNGS, OR STOMACH — VOMITING — SIMPLE DRESSINGS, THEIR PREPARATION AND APPLICATION.

*Bedside Observation.*—Lessons in elementary nursing would be incomplete without some reference to temperature and to the use of the clinical thermometer (Fig. 40).

In severe or doubtful cases it is a guide to the medical officer as to the progress of the case if the temperature of the patient be ascertained at intervals from day to day—the normal (natural) temperature of the body in health is usually  $98.4^{\circ}$  F. It may vary a little either above or below this



FIG. 40.—Clinical thermometer.

without being a sign of anything serious; but if it goes above  $100^{\circ}$ , or below  $97.3^{\circ}$ , and remains so, there is something calling for anxiety.

The hospital orderly should be familiar with the use of the bedside (clinical) thermometer.

The common form used is 4 inches in length, graduated in degrees and tenths of degrees from  $95^{\circ}$  F. to  $100.3^{\circ}$  F. Part of the column of mercury is detached to form the index, which rises or falls according to the temperature. At

the point  $98.4^{\circ}$  the thermometer is stamped with an arrow head mark. Before using the instrument the index must be shaken down to just below the  $98.4^{\circ}$ , the thermometer is then ready to use, or set. The setting is accomplished very easily, as a rule, and the swinging or jerking must not be too violent, or the index will be lost by rejoining the rest of the mercury in the bulb. To take the temperature the patient should lie perfectly quiet in bed; the neck of the shirt unbuttoned, and any folds of it pulled down from the arm-pit; place the bulb of the instrument in this in such a manner that the flesh of the upper arm may compress it against the floor of the armpit. To accomplish this thoroughly, let the patient fold his arms across his chest, placing the hands flat, the arm and hand of the side of the armpit used being next the chest; direct the patient to keep his elbow close to his side and not to let the instrument fall out, and leave it in place five minutes. To read the thermometer, remove it from the armpit, hold it horizontally, read upwards from the arrow-head mark ( $98.4^{\circ}$ ) till the top of the index is reached—*i.e.*, the end farthest from the bulb of mercury—the degree, or tenth of a degree, at the end of the index is *the temperature*. This should be at once written down, and the hour noted, and the thermometer carefully returned to its case. Any great rise, say to  $105^{\circ}$ , or lowering to  $97^{\circ}$ , should be specially reported. In ordinary cases the temperature is taken morning and evening. In addition to taking the temperature, the orderly may be required to take the pulse and also to register the number of respirations per minute.

**Pulse.**—The throbbing of the radial artery just above the ball of the thumb on the inside of the forearm may be counted by gently placing the tips of the first and second fingers on that spot, and the thumb behind the wrist. A watch with a second hand must be used to count the beats, which in health should be from 70 to 80 beats in the minute. A lengthy description of the pulse in disease



would be out of place here ; but if the pulse is very rapid (140 or 160), very irregular, very feeble, or below 70, there is cause for alarm, and a special report of the fact should be made.

**Respiration.** — To register the respirations, *i.e.*, the number of times a patient breathes in and breathes out in a minute. Kneel or sit down by the bedside, take a watch with a second hand, and with the other disengaged hand placed flat, and palm downwards, upon the upper part of the patient's abdomen count the number of times per minute the hand is lifted up by it. In addition to the mere counting, the character of the breathing should be noticed ; and in severe cases any sudden change in the respiration,—for instance, struggling for breath, hurried breathing, apparently inaudible breathing, sighing or snoring, puffing of the cheeks,—may mean changes of much gravity, and should be at once reported. The respirations in health should be 18 to 20 a minute.

**Bleeding from the Nose, Lungs, or Stomach, and Vomiting,** are occurrences which must be specially reported.

*Bleeding from the Nose* (Epistaxis) sometimes is most difficult to check, and can only be effected by the surgeon. In his absence, however, bare the neck, make the patient sit, or better lie, down, with the head well thrown back (never let him stoop down over a basin, but spread a towel across his chest to protect his clothes), holding his arms well above his head. If this does not stop the flow of blood, apply a sponge wrung out in cold water over the forehead and nose, or ice ; apply ice or cold water sponge also to the nape of the neck. Slipping a large door-key down the skin of the back is an old-fashioned popular remedy.

*Bleeding from the Lungs* (Hæmoptysis) is known by being accompanied by cough, and is usually, except in the case of a rupture of a large blood vessel, in small quantity.

The blood coughed up is bright red, frothy, or mixed with saliva, or mucus from the chest.

*Bleeding from the Stomach* (Hæmatemesis) is accompanied by the patient "throwing up" or vomiting. The matter thrown up is seldom bright, but nearly always dark brown, or even black and thick like coffee grounds, particles of food can be sometimes detected in it.

There is scarcely anything the attendant can do in either of these cases beyond making the patient lie flat with the head raised, and after the attack giving a little ice to suck, or iced drink in very small quantities.

*Vomiting* should be assisted by raising the patient up so as to lean upon the elbow, and just before vomiting he should be given a drink of water, warm if possible. A tumblerful of water thus swallowed often relieves the retching and straining which is such a distressing accompaniment of the act.

**Preparation of Applications and Dressings.**—In the hospital and surgery tents one of the most useful articles of furniture is a kettle, and some means of boiling it. A spirit lamp, or stove of some description, and small kettle, should form part of the light equipment of the bearer section. Hot water—not only hot, but boiling—is one of those things which cannot be dispensed with in nursing and in minor surgery, and may be wanted at any or every hour of the day or night. Amongst other useful utensils, although in importance secondary to the essential kettle, I may mention one or two small saucepans, enamelled inside, iron or tin basins, mugs, plates, spoons, water jugs, feeding cups, and pails, and well-stopped tin hot-water bottles.

In the surgery tent will be kept the medical stores, in it will be treated all minor casualties, and sick diet required at short notice prepared. Several small camp tables, or tables improvised out of any materials at hand, such as boards, barrels, boxes, &c., should be arranged round the walls of

the tent, and a steady seat for patients also. The spirit stove and kettle must have a special position to themselves, selected as being out of the way of the feet and protected from draughts ; to avoid risk of fire let the stove stand in a tray or basin. Plenty of water should be at hand. One table should be retained as the surgery table, upon which should be bowls, water, sponges, lint, cotton-wool, plaster, bandages, splints, scissors, pins, and threaded needles. The wool, lint, and plaster should be cut and prepared, ready for use under the direction of the surgeon in charge, and not left in large bulky, tied-up packages until wanted, as is too frequently the case.

A second table may contain linseed meal, mustard, tow, bowls, and spoons ; a third, basins, towels, and water, and the medicine chest, or the latter may have a table to itself.

*Simple dressings and their application.*—By **dressing** is meant the application of materials to wounds and sores, and also includes their cleansing. For a wound to progress well, it must be (*a*) cleansed before anything is applied to it, and kept in a cleanly state ; (*b*) the divided parts must be brought together ; and (*c*) kept at rest.

**Cleansing.**—Wash the wound gently by squeezing out a ball of cotton wool dipped into antiseptic water, directing the stream on to the wound from the height of three or four inches ; next draw the ball of wool gently along the edges of the wound to remove clots of blood, or dirt, or foreign bodies, splinters of glass, for instance, or sand. Antiseptic water should be used when procurable ; the antiseptic lessens the risk of the wound being poisoned from without ; various antiseptic waters are used, but the most common is carbolic water (1 part to 40 or to 100).

**Adjusting the severed parts.**—When the wound is deeper than the mere surface of the skin, or when its edges gape, it will require to be stitched ; this, of course, will be done by the surgeon. If it be slight, and clean cut



(incised), the edges can be brought together and held with plaster.

There are many varieties of sticking-plaster ; perhaps the most familiar to all is the household diachylon, or lead plaster spread on calico. This, before it can be applied, must be heated to render the yellow side adhesive. For this reason, because means of heating are not invariably at hand in camp and in the field, I strongly recommend Seabury and Johnson's rubber self-adhesive plaster, or Leslie's similar kind, which requires no heating, and which, when adjusted and pressed on the skin, sticks instantly, and can be washed once or twice without coming off like the ordinary kinds.

After washing the wound, wipe the skin outside it dry with

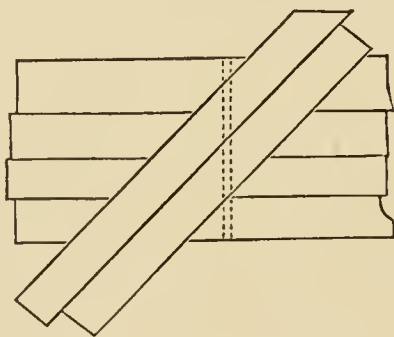


FIG. 41.—Applying plaster to close a wound. The dotted lines represent the edges of an incised wound.

a scrap of lint and cut some plaster in lengths of  $1\frac{1}{2}$  to 2 inches, and not more than  $\frac{1}{4}$ -inch in width. If the ordinary plaster, it must be thoroughly warmed before application. The proper method of heating plaster is to lay the calico side upon the cover or side of a tin can containing boiling water until the prepared or yellow side is perfectly warm and sticky. With the finger and thumb of the left hand draw together the edges of the cut, and with the right hand apply the plaster across the cut, as shown in the diagram (Fig 41), applying enough strips side by side to cover the line of wound ; finally, cross the last-named strips diagonally with two or three others to keep the under strips in place and the



parts on each side at rest. Each strip should slightly overlap the one last applied, and generally from above downwards.

The above instruction applies to small surface wounds only; in more extensive wounds and deeper, the plaster applied after the insertion of stitches by the surgeon will be cut of larger dimensions, according to the requirements of the case.

**Wounds lacerated and contused.**—In the last variety (incised) the wound has been clean cut, with straight edges; in lacerated wounds the edges are jagged, and in *contused* wounds, in addition, the skin and edges are bruised. Sometimes stitches are put in, but more often not, as in 24 hours the edges are pretty sure to gape and swell, rendering perfect adjustment of the sides impossible.

The first treatment is the same as in the incised variety—namely, the careful washing and cleansing; the dressing, however, will not be plaster, but lint wetted, called *water dressing*. A square of lint, one side of which shall be a little longer than the wound, is to be wrung out of water, folded upon itself once to form an oblong, and laid on the wound; over the lint is next placed oiled-silk or guttapercha tissue cut in each direction a little smaller than the lint (if cut larger, instead of cooling, it will act as a poultice to the wound), and a turn or two of light bandage is placed on over all.

*Dry dressing* is the arrangement of plaster described for incised wounds, with, in addition, one or two folds of dry lint placed over the crossed strips, and retained in place by more strips, or with a turn of bandage.

*Ointments and oils* are used to irritable wounds, and for burns and scalds. Strips of lint are spread with a thin layer of ointment, or soaked in the oil and laid across the wound or burn. It causes much less pain in *un-dressing* the wound if the lint previously applied has been put on in strips instead of in one broad sheet.

*To prepare a wound or injured part for re-dressing*, first

collect the materials and prepare them one by one. For instance, if the dressing is to be dry, cut your plaster strips to the required size, having first filled your tin can with boiling water, laying them, linen side downwards, upon it to become adhesive; next cut your lint outer covering, and place your roller bandage within reach, or if a triangular fold it the requisite width. This done, fill a saucer or bowl with warm carbolic water, place under the wound a basin or mackintosh: unfix the bandage, and remove whatever lint or wool will come away freely without dragging. Next take a ball of clean wool or bit of sponge, dip it in the warm water and squeeze it out over the remaining old dressings so as to soak and soften them. When the plaster and lint caked with blood and discharges have become thoroughly moistened, bit by bit they can easily be removed.

Sometimes the removal may occupy a considerable time. Do not lose patience, for by a hasty movement you may drag open the edges of the cut. If the plaster proves obstinate, insert the finger nail between its edges and the skin so as slightly to separate them, and then direct a stream of warm water from the sponge into and over the apertures thus made. When all has been removed, wash the wound as directed under "*cleansing*." With a little oil smear the portions of skin to which the plaster was adherent, this will enable you to remove any small particles of adhesive remaining in crumbs. Gently wipe the skin with a little dry lint and the new dressing may be applied. Always remove from the neighbourhood of a wound the smallest particle of the old dressing, stale dressing left behind quickly decomposes, setting up irritation in the wound and sometimes causing erysipelas or blood poisoning.

*Fomentations, Poultices, and Blisters.*—A fomentation is used where it is desired to apply warmth with moisture, and consists of a flannel steeped in boiling water, wrung out as dry as can be and then applied to the skin, some cotton wool

or dry flannel in folds covering it. To the water is often added some medicament to produce a soothing effect, such as laudanum, or belladonna; when required as an irritant turpentine is sprinkled over the flannel before application.

The routine plan of preparing a fomentation is to immerse the whole flannel in boiling water, pick it out, place it after draining in a hot dry towel which must be quickly folded over it, and seizing the two ends of the towel twist them in opposite directions. Take the flannel out, fold it quickly to the size wanted, and apply it as hot as the man can stand it.

*Poultices* are dressings for the application of either heat and moisture, cold, or a cleansing agent to wounds, and are nearly always used to produce a soothing effect.

This they may do partly in a directly mechanical manner by softening the tissues, thus relieving the pressure on the nerves of the part, as in the instance of a hot linseed poultice applied to a part hardened by inflammation; or indirectly by inducing a greater circulation of the blood at the surface of a part in order to relieve too great a blood supply in a portion below the surface or in some internal organ.

The materials used for making poultices are various, the most familiar being crushed linseed, mustard, bread, and bran; also charcoal, yeast, boiled potato, oatmeal, and knobs of ice.

The poultice most often used is the linseed poultice. To make it the following materials must be collected (1) a sheet of tow, a folded flannel, or cloth, or in an emergency, a sheet of brown paper or a large cabbage leaf spread out on a table or board, and a little larger than the part to be poulticed; (2) a bowl and spoon; (3) the crushed linseed; (4) a kettle and boiling water. Warm the basin and spoon thoroughly by pouring into the former some boiling water, empty this out when the basin is warmed,



put in some meal, add a very little hot water, and stir into a soft paste with the heated spoon. Continue doing this till enough paste has been made to cover the tow or cloth; the layer of meal should be not less than  $\frac{1}{4}$ -inch thick, spread it flat, either with the spoon or a knife warmed, to within an inch of the edges of the tow or cloth, and fold up these to form a margin. Neither too much nor too little water must be used, the poultice must be soft without being sloppy; to test if it can be applied place the back of the hand on the steaming meal; never omit to do this. Invariably make the poultice at the bedside, place the linseed next the skin, and remove it after two hours, carrying it at once out of the tent or ward to be burnt.

Bran, bread, and potato poultice are made in the same way as that described for the linseed, the bread or potato being first crumbled; and a charcoal poultice is best made by making first a bread or linseed poultice the size required to cover the sore or wound, and, just before applying it, to sprinkle powdered charcoal thickly over the meal or bread. As a stimulating application, mustard mixed in, or sprinkled over, the freshly made poultice is frequently employed.

*Blisters* are applied to parts in order to raise on the skin small watery bags or blisters, or to produce a superficial inflammation of the skin, thus acting as counter-irritants, *i.e.*, to irritate a superficial healthy part artificially, that a deeper part may be relieved by in this way drawing the superabundance of blood from it to the surface.

The only blister I need allude to here is that made with mustard. To make it, mix some fresh dry powdered mustard in a cup into a soft paste with *cold* water. Spread the paste on some brown paper evenly and apply to the skin. If the mustard is good, twenty minutes is quite long enough for the application. After taking it off, sponge the blistered skin with damp cotton wool to get all the mustard off, subsequently oil the part with a little olive oil and cover with lint.



*Sprains, Bruises, Scalds, and Burns.*—A sudden twist or wrench to a joint is called a sprain, and is followed by pain and inflammation. The most commonly sprained joint on service is the ankle, and next in frequency comes the knee.

*Treatment* in the early stage of a sprain is simple, and may be summed up in the words,—perfect rest, support, and cold applications.

A sprain is usually intensified by a man's endeavour to hobble on instead of at once giving in. In the case of the ankle joint, if the sprain occurs away from camp and the means of procuring a roller bandage, do not remove the man's boot but slacken the lace a little ; so long as the boot is on the foot the joint will receive support, one of the essentials of the treatment, and undue swelling may be prevented, always an object of moment. As soon as the man can be carried to a place where he may rest, remove his boot and sock and apply a well wetted roller bandage from the toes up, covering the whole foot, ankle joint, and a few inches up the leg ; elevate the injured joint so that the foot may be as high as the hip, and as soon as the bandage dries, wet it again by pouring cold water over it.

A knee sprain at first may be treated in exactly the same way, but as sprains of this joint are usually much more obstinate, it may be as well to apply behind the knee a straight well-padded splint, covered with oiled silk, applied after the wet bandage by one or two turns of bandage above and below the knee.

In bandaging for sprains do not commit the mistake of bandaging too tightly ; sometimes, if a joint has been sprained for some hours without treatment, it is so painful that a bandage cannot be borne. Here a splint must be applied and a bag of ice, or an evaporating lotion. A very easily prepared evaporating lotion may be made by mixing one part of whisky or other spirit with ten parts of water. Narrow strips of lint should be dipped in this and laid

tightly across the joint, the lotion being frequently re-applied to the lint.

*Splints* made of plaster of Paris are sometimes applied to sprained joints, and to fractures when attended to by a surgeon, immediately after the injury and before swelling has set in. These are not to be applied except by special instruction from the surgeon and under his supervision ; the reader may perhaps desire to know their method of application and preparation, which are as follows :—

“ In all cases the limb should be cleansed and carefully dried, the bone itself being well protected by cotton wool or a flannel bandage. The bandage with the stiffening material is then to be prepared, and it should be put on as smoothly as possible, no more turns being employed than are absolutely necessary.”—*Bryant*.

The bandages, with the stiffening here alluded to, are made of coarse muslin, 2 inches wide and about 2 yards in length ; they are unrolled into a basin containing dry plaster of Paris in powder, the powder being well rubbed in through the meshes of the muslin, and are now rolled up again loosely ; they are next stood in a dish of water till they are well wetted through, and then applied to the joint or limb like an ordinary roller, with this important difference, that turns or reverses are never made, the bandage being allowed, so to speak, to take its own course ; and being of yielding material, it will sit to the swell of a limb fairly well without turns. As the muslin is being wound round the limb, plaster of Paris moistened into a soft creamy paste has to be rubbed into and between each turn. Sometimes two or three rollers are applied over each other ; finally, after the bandage has been smoothed into place, some of the plaster paste is evenly smeared all over. The application soon becomes dry and forms a very valuable support. Before applying the first bandage of flannel, it is customary to lay along the middle length of the limb a piece of tape or narrow bandage ; the ends of this must project above and below

beyond the flannel roller. Should it be necessary to examine the skin of the limb subsequently, this tape acts as a guide to the scissors or pliers in cutting up the splint, and by it also the limb may be swung in a cradle.

*Bruises* or *Contusions* are nearly always produced by a force applied to the surface of the body suddenly compressing the tissues with violence against the unyielding bone beneath, and resulting in the rupture of some capillaries, or small surface veins. This rupture of the small vessels and escape of blood from them causes the discoloration of the skin so well known as characteristic of a bruise. Beyond keeping a severely bruised part at rest, and sometimes supporting the contused tissues by an evenly applied bandage, no treatment is needed in most cases. Cold is sometimes applied if the contusion is unpleasantly obtrusive; for example, in the case of a black eye, in which it will be remembered Mr. Alfred Jingle recommended a raw beef-steak or a cold lamp-post as sovereign remedies.

*Scalds and Burns*, independently of the damage done to the skin or tissues beneath, are always serious accidents, from the amount of depression or shock caused to the system. The amount of shock is proportionate as much to the extent of surface scalded as to the depth of tissue burnt, extensive scalds about the face, chest, or trunk being particularly dangerous. The amount of prostration may be so great that it will be necessary to pay immediate attention to that rather than to the injury. Get the patient covered with blankets, and apply hot bottles around him if he be shivering and fainting, and if he can swallow administer warm wine and water, or better, beef-tea with wine.

The first thing to provide for in the local treatment is to exclude the air from the scald or burn; as quickly as possible flour or whiting must be thickly dusted over the part, or pour olive or linseed oil over, and cover either of these with a thick layer of cotton wool or wadding or lint tightly bound on with a bandage. For surfaces extensively

burnt triangular bandages are very useful. The exclusion of air if complete does much to mitigate the excessive pain, and with this the state of shock.

There should be no hurry to exchange even makeshift coverings for ones more suitable till the sufferer has rallied and is well under cover. In the hospital tent applications suitable for such cases should be in a state of readiness ; these usually are lint steeped in strong solution of soda, or the same in carron oil, a mixture either of equal parts of linseed oil and lime water, or of the latter with olive oil.

Where the clothing is burnt it must be cut away, disturbing the injured part as little as possible, and not dragging away any portion sticking. The first dressings applied may be left on twenty-four hours, and should be thickly covered with wool.



## CHAPTER VI.

SICK DIET AND INVALID MANAGEMENT—SIMPLE COOKING  
FOR THE SICK-ROOM—FEEDING AND WASHING PATIENTS  
—BATHS—BED-MAKING.

FOR a healthy man taking free exercise, the following quantity of mixed diet should be ample for one day's support :—

Meat,	.	.	.	16	oz.
Bread,	.	.	.	19	oz.
Butter or fat,	.	.	.	3½	oz.
Water or its equivalent,	.	.	.	52	oz. ( <i>Dalton</i> ).

The ration of the soldier does not quite reach Dalton's standard, 1 lb. of bread and  $\frac{3}{4}$  lb. of meat being the Government allowance. All other articles of diet are supplied by himself.

From the above figures it will readily be seen that a man not doing hard work—and a man in hospital comes under this head—will require considerably less, even if not at the time suffering from constitutional disturbance.

But a man acutely ill, although an adequate supply of suitable food is as essential to his existence as to that of a man in perfect health, is utterly unable to assimilate (digest and make use of) either such food, or in such proportions. A camp dinner of, say, Irish Stew, with no stint of dumpling and potato, though appetising enough to an ordinary man after a stiff morning's drill out in the open, would be regarded with no particular approval if a plateful of it were

placed before a sick man in hospital. This does not, of course, apply to convalescents, who, as every one knows, frequently possess appetites so great as to be positively alarming just before their discharge as fit for duty.

In a brigade hospital in a town it will be a matter of as much anxiety to the principal medical officer to secure good cooking for the sick as to have them well housed. In such an instance there should be no more difficulty in obtaining the requisite cooking than in the collection of bedsteads and furniture.

It is under canvas that some little hitch may occur, and that the sick may not be provided with such dietary luxuries as would be possible in a town, and not only this, but where field ovens and ranges have to be depended upon for cooking, it would be next to impossible for the cooks to prepare special sick food, except at odd intervals between the cooking for camp, or without almost a day's notice. The making of light milk puddings, fish cooking, &c., if wanted for hospital, might be left in the hands of the camp cooks; but the preparation of many articles of diet common to the sick-room, and so grateful to those suffering, should be within the resources of the hospital attendants.

It is only those preparations of sick diet which are constantly called for, and which are easy enough to prepare with the aid of the most simple utensils and materials, which I touch upon here. If our bearers should never be called upon to make them, it will still be some satisfaction to them to be aware that they could in an emergency do so.

As I have elsewhere stated, no camp or other hospital should be without its filter. Should this useful piece of furniture be absent, no patient should be allowed to drink water which has not been boiled. About what is enough should be boiled early in the day, and set aside to cool in jugs or earthenware crocks.

**Drinking Water.**—To have really cold, palatable, drinking water at hand on a scorchingly hot day in a close tent is no

easy matter, but may be provided with a little forethought. A shady spot should be chosen, or created, near the tent door, or outside if no air is blowing into the tent. Fill the jug with filtered water, wrap round it a linen bandage from top to bottom, and stand the jug thus swathed in a saucer or dish full of water, and wet the bandage thoroughly and put more water in the saucer from time to time.

**Lemon Water.**—Cut the lemon in a saucer right across in two equal halves. Squeeze as much of the juice as you can into a jug with the fingers. Take a second saucer, and squeeze each half of the lemon between the two saucers; you will thus get most of the juice out of the fruit. Add cold water to a pint, and sweeten with white pounded sugar. Should the water thus prepared be too acid, add more filtered water. Be careful with the sugar, for a lemonade too much sweetened, instead of relieving, often aggravates thirst.

**Lemon Drink** is usually prepared by simply cutting the lemon across in slices, adding one to two pints of boiling water, and then sweetening. As the oil in the peel, however, often disagrees with a deranged stomach, a better plan is to thoroughly peel the fruit before slicing, and to omit using the rind altogether.

**Toast Water.**—It is no easy matter to toast bread at a small portable stove. Get a round of thick bread a day old toasted by the camp cook,—a good rich brown. Put it into a jug with a slice of lemon, and add two pints of boiling water; cover over, and, when cold, administer as a cooling draught.

**Barley Water** requires rather more manipulation. Wash 2 ounces of pearl barley, and add 4 pints of boiling water, boil for quarter of an hour in an enamelled saucepan, and strain through a bit of muslin, throwing the strained water away. Now pour on the swelled barley 2 pints again of boiling water, and boil this down to  $1\frac{1}{2}$  pints; strain a second time, and it is ready.



**Milk** is a complete diet in itself; that is to say, it is a food substance combining the four chief nutrient elements necessary to sustain life. As an article of food, therefore, it is the most valuable we possess, and just in proportion to its value is the difficulty of storing it in a condition fit for food.

Milk decomposes or goes bad more readily than any other article of diet, and is most rapidly impregnated with neighbouring foul gases, absorbing, and tasting of, them; if kept in any close atmosphere, such as that of a room in which there are many people, or in an hospital ward, it goes sour almost immediately. The difficulty of keeping milk fresh in hot weather is universally known, and any served out morning and evening for the use of the sick must be at once treated by the orderlies on duty as follows:—

Any jugs, bowls, or cans in which the morning's supply is fetched, should, a short time previously, have been *scalded* out with boiling water,—not merely washed out with warm or cold water,—and inverted to let every drop of water escape. Whilst being carried from the place of distribution, each vessel containing it must be covered up, and the milk which happens to be in any metal vessel must be either used up at once or transferred to one of crockery. *Never store milk* in vessels of either *tin, zinc, or copper*, even for half an hour. The remainder may be put into a long jug or bottle, filled to the mouth and covered with a china plate or saucer. The jug should now stand in a tub or can three-quarters filled with cold water, the whole covered over with a damp cloth, and placed right outside the tent or room in a cool shady place, in a current of *fresh* air. On a cool day the milk will keep some hours thus. On a close sultry morning, after using as much as is immediately wanted, boil the remainder and store it as above directed. Be careful to scald out your saucepan before boiling the milk, use no saucepan of bare tin; if it be large enough, put a crock inside it to hold the milk, and fill the space between the two with water, and then boil.



**Boiled Milk** is very conveniently kept sweet in glass bottles, if good corks can be found for them. The neck of the bottles should be filled right up, so that when tightly corked there can be no air between the cork and the milk, and immediately sealed over, if possible, with sealing wax. Stand the bottles in a current of fresh air or in cold water. A little sugar aids the preservation. Bicarbonate of soda, about enough to cover a shilling, to a quart, with a little sugar, is also a preservative. "This will keep for ten days or a fortnight" (*Parkes*).

**Eggs.**—To test the soundness of an egg, shake it close to the ear; if fresh, scarcely any sound will be heard, but if stale you will hear a sort of thud as if a ball of soft material were shaken down. A bad egg will float readily on water, an egg new laid sinks at once. Fresh eggs are transparent about the middle, stale eggs at the top.

If you suspect an egg after cracking it, to be at all doubtful, give the patient the benefit of the doubt, and throw it away. Crack the egg when wanted by one or two blows on the edge of a cup, and catch its contents, letting it all drain in; beat it up quickly with a fork, add a little powdered sugar, beat in gradually three tablespoonsful of cold water and one of brandy or whisky. This is the common **brandy mixture**, which, as it can be so readily and easily prepared, is a most useful form of restorative to give in an emergency in the field or in a camp hospital.

**Arrowroot** is often needed as diet in cases of diarrhoea. In preparing it and many other sick comforts, the hospital stove and kettle should be in action. Mix nearly a tablespoonful of arrowroot with a little cold water in a breakfast cup, grinding it down very smoothly. Place this in an enamelled saucepan, add warm water to half a pint, stir over the stove till the water just boils, and then remove.

Powdered sugar is usually added, and sometimes some grated nutmeg, or powdered ginger, both useful in griping of the bowels.

**Cornflour** is prepared just as readily and by just the same steps, take two teaspoonsful to the pint, and use milk instead of water. Both arrowroot and cornflour may be used to thicken beef-tea; either is added during the mixing of the beef-extract with the hot water, and the mixture warmed up to the boil.

**Beef-tea** proper is made from fresh lean gravy beef, or rump steak. Take a sharp knife, cut one pound of the meat quickly into pieces not larger than dice, and place them in a jam crock small enough to go into a saucepan; put into the crock one pint of cold water and a small pinch of salt. Fill the space between crock and saucepan three-quarters up with cold water, and simmer, *not boil*, for one to two hours. By this time all “the good” of the meat should have been extracted; strain through muslin, and you will have from  $\frac{1}{2}$  to  $\frac{3}{4}$  pint of strong beef-tea.

*Extract of Beef* in pots is one of the indispensable medical comforts which should be in every hospital. Its value as a stimulating restorative after severe shock, or exhaustion from exposure, or from other causes, is enhanced by the ease and celerity with which it can be prepared as beef-tea, or mixed with wine or spirits and water. To make beef-tea with it, take a perfectly dry teaspoon half full of the extract, and quickly rub it down in a breakfast cup with hot water, stirring it and adding the water gradually till it has all dissolved.

There are so many new patent extracts and essences of beef in hospital use that I cannot attempt to mention them all, but from practical experience I know of the excellence of the following: Carnrick's Liquid Peptonoids; Kemmerich's, Mason's, Johnston's (Bovril), Brand's, and the Liebig beef-tea extracts and essences.

**Tea, Coffee, Chocolate, &c.**—Tea is always wanted by some of the sick, and is seldom forbidden by the medical officer.

It may seem superfluous to give directions for making

tea, but really very few know how to make it perfectly. Boiled tea is most unpleasant, besides being injurious, and that is what is usually sent out from the camp kitchen.

Remove entirely all old leaves from the teapot, wash it out with cold water, and drain it as dry as possible. (Tea can be just as well made in a jug). Be ready with the tea, dry teaspoon, and jug or pot. Just before your kettle boils, pour enough hot water into the jug to thoroughly heat it, and empty this out as the kettle boils. Put in the tea—one full teaspoon of good tea should make four tea cupsful, about a pint—cover the tea to the depth of  $\frac{1}{2}$  inch with boiling water, close the mouth of the jug with a saucer, and wrap it, or the teapot, up in a flannel for three minutes, then add a pint of boiling water, and let the infusion stand for another three minutes, and pour out.

**Lemon tea** makes a most refreshing drink in feverish cases ; prepare as if making tea but add a slice or two of lemon, and serve when cold ; using less tea to the pint of water.

In making **Coffee** allow 2 teaspoonsful to each man and  $\frac{3}{4}$  pint of water. Scald out the jug, and pour the boiling water on the measured out coffee the instant the kettle boils ; pour the mixture, with a fall of a few inches, into a cup and back into the jug twice to clear it. Cover the jug with flannel and saucer, and let it stand five minutes before serving. If a hot stove plate is available, the coffee may have its flavour developed by being put into the jug, which should be dry and covered with a saucer, and standing the jug on the hot plate a few minutes before adding the boiling water as before.

**Chocolate** is very simply made. Crumble up the cake of chocolate in a cup, add boiling water, pound it down and mix it gradually into a paste ; add more water or warm milk.

**Cocoa** is usually in the form of powder ; quickly prepared by rubbing into a smooth paste and adding boiling water



and milk and sugar according to taste ; all these beverages should be given with milk when procurable.

In using any of the patent foods mentioned, be careful that the spoons before use are wiped and polished, and never leave a spoon in any preparation, but immediately after mixing place it to soak in cold water, and after a few minutes wipe and clean it. Printed labels instructing as to quantities to be used are always issued with the packets or tins.

It should be needless to observe that the utmost cleanliness, both personal and general, is essential in the preparation of food stuffs for the sick, as indeed in performing any other office for them. The diet should be served as elegantly as the utensils available will allow ; a little extra trouble in setting out a tray or extemporised table on which the food is placed is never thrown away. All medicine bottles, glasses, spitting cups, and other ward etceteras must be moved away from the sickbed for the time being. Cups and plates which have been used, and also all food not in use, should be at once carried right away out of the tent or ward. Diet should be cooked and prepared in another tent out of the patient's sight, for scarcely anything is more sickening to invalids than the smell of food cooking.

Never store what is to be used as food in the tent ; do not prepare too much at a time, but as night approaches have a little in reserve which can be brought without delay in case of emergency.

**Invalid Attendance.** — *Feeding the Sick in Bed.* — A patient requiring lifting to be fed or given medicines must not be suddenly raised as this sometimes brings on a fit of syncope. Neither is it proper to cram a pillow or two extra under the head and then attempt to feed, for this method only hampers his powers of swallowing and of breathing.

If it is only required to raise the man for a few seconds to give medicine or a drink, go to the side of the bed with the



feeding cup in one hand and pass the opposite hand and arm under the pillow and across the patient's shoulders, raising not only his head and neck but his shoulders a little also, and letting his head recline on your own shoulder. Do not put the cup to his lips till he has been steadily raised up. If he be too helpless to guide the cup and hold it, tilt it up when touching the lips very carefully, never letting more than about a teaspoonful of the fluid enter the mouth at a time, waiting before proceeding until by the movement of the front of the throat you can see that the first teaspoonful has gone down "the right way."

To sit a patient up comfortably, pass a board, or valise, or something stiff under the pillow ; get another attendant opposite to steady one end, and together—supporting the head and neck—raise the board to the height you require ; fill in the space behind with more pillows, rugs, blankets, or any articles at hand, packing them to form a steady support ; across the man's knees can be laid something flat to serve as a table if he is well enough to feed himself, if not, he must be fed by the orderly in small spoonfuls. This will often require much patience and coaxing, as sick people are fractious and generally desire to be let alone.

**Washing Patients.** — In camp, means of bathing are usually of the most primitive order, and a bath means only a bucket or basin and a couple of pints of water sometimes. Still, possessed of a sponge, a very refreshing sponge-bath may be enjoyed with these.

Every sick man too helpless to do it must be sponged all over once at least in the 24 hours. Except in cases of the utmost gravity, and these will, of course, be pointed out by the surgeon, there can be no excuse for omitting this.

Except to wash the scalp the patient need not be propped up ; his sleeping shirt should be drawn off and laid across his chest, a towel edged under shoulders and head, and a

second over his chest. The head and face should first receive attention. Begin by sponging the eyes, nose, mouth, ears, and the rest of the face, never taking much water in the sponge, and wringing it out frequently. Dry the face and forehead, get help to prop him up, then wash in the same way the back of the head, all the neck, and the scalp, and dry all these thoroughly—the patient can now lie down again. Little by little the chest, armpits, abdomen, and sides can be sponged, rubbing dry each part before going on to another; next the groins, and pubes, front of thighs, knees, legs, and feet. After each part has been washed, it must be covered before proceeding to bathe another. To wash the back of the trunk and legs, roll the patient either on his sides one after the other, or, if he can stand it without danger, right over on to his face; carry on the ablution in the same way. A little soap lather for the scalp, armpits, crutch, &c., feet, and hands, should be used, but it is not necessary to soap the whole body. If care is taken by tucking in towels here and there, and by wringing out the sponge, not one drop of water need wet the bed, and two orderlies can wash a patient and rub him comfortably dry in a very few minutes.

**The Blanket Bath.**—A simple vapour bath. Sit the man stripped on a cane or wire-seated chair placed on a mackintosh sheet, put his feet into hot water, using two buckets or a small tub as a foot-bath; drape blankets around him from his neck, so as to envelop him, the chair, and the buckets completely. Stand a small tin of boiling water just inside the blankets, not near enough to scald the patient, and let him rest where he is for a quarter of an hour. Have plenty of towels to rub him down in readiness, and let him get into bed between blankets. This is a useful form of bath where it is necessary to encourage the skin to perspire, as after catching cold.

Under canvas it is more than probable that only the bathing I have described can be attempted, but in town

billets no doubt a bath more orthodox will be procurable. A necessary adjunct of the bath in hospitals is the bath thermometer; and nurses are instructed never to put a patient into the bath without using it,—a very salutary rule, which attendants in organised hospitals must carry out; but an extemporised hospital may not be so replete with every convenience, and to test the temperature of a hot bath the orderlies must go by the following rule of thumb, or rather, in this instance, “rule of *elbow*” :—

Hot bath, temperature from 102° to 110° F.			
Warm	„	„	96° to 102° F.
Tepid	„	„	85° to 95° F.
Cold	„	„	below 85° F.

In making ready, the bath should be placed within two yards of the patient's bed. If it be other than a cold one, pour the hot water in first and gradually add cold until *the naked elbow* of the orderly placed in can readily stand the heat without discomfort.

This will prove that the bath is not too hot for use. Never fill a hip-bath too full, two-thirds full is sufficient. Let the patient test the bath himself by putting his foot in it, and help him to sit down gradually. Whilst in the bath wrap a blanket over his legs and feet. A quarter of an hour is usually the time ordered for the immersion; a little extra boiling water should be added during the period to make up for the loss of heat from the water quickly cooling.

Be careful not to scald your man in doing this; make him move his thigh to one side whilst you pour the water in at the side of the bath, and stir it in quickly to distribute the heat.

**Bed-pan and Urinal.**—One orderly must slip the pan under, whilst two others raise the patient in the manner described on page 178. If the slipper bed-pan is used very little moving is necessary beyond rolling the patient on one side or the other.



The urinal is attached to all modern bed-pans as a sort of spout. Separate urinals are most frequently used of china, and flask-shaped, as being smaller and much less unwieldy than the bed-pan.

The only necessary caution in this attendance is to avoid slopping, and to carry all slops immediately away; a little disinfectant solution or carbolic water being always left in both bed-pan and urinal before and after use. The *débris* of the ward, such as poultices, stained lint, wool, or any other dressings removed from wounds, must be removed separately and specially destroyed by burning; on no account must they be thrown into a slop-pail containing excreta or urine; and it should be unnecessary to state, on no account must stale dressings even of the smallest size be thrown down a water-closet drain, though this has been done by ignorant and careless nurses before now.

**Making Beds, &c.**—If the patient can bear the removal, and always with the surgeon's sanction, the most expeditious way to re-make a bed is to lift the sick man into another alongside. All the clothes should be removed and shaken, being especially particular to leave no crumbs of bread adhering to the sheets.

*Changing Sheets.*—In cases of fracture of the lower extremity, undersheeting must be changed as seldom as possible, but may be kept in good condition by careful covering with a narrow draw-sheet under the patient's buttocks; any changing in such a case must be carried out under the personal supervision of the surgeon. There are two things to avoid in changing sheets—(1) giving a chill by needlessly uncovering; and (2) doing damage by disturbing the patient.

*To change the under Sheet,* roll up from head to foot of the bed the sheet you are going to remove lengthwise, having first untucked it all round, and having rolled the sick man on his side if permissible; go on rolling till it reaches the back of the patient. Roll the fresh sheet also



lengthwise, unrolling it over the under blanket from the edge of the bed so as to cover the space left bare by the old sheet. Secondly, turn the patient on to his back, this will make him lie on the rolls of the new and of the old sheets ; next turn him on his other side, thus bringing him over that part of the bed covered by the fresh sheet. Lastly, roll off the bed the rest of the old sheet, and complete the change by unrolling the rest of the new.

*The upper sheet* is changed by two attendants standing on either side the bed by the head, each taking hold of the lower border of a fresh sheet, which may be rolled cross-wise, and slipping this border beneath the old sheet previously untucked at the patient's chin, steadying the upper blankets and quilt with their disengaged hands, and drawing the new sheet downwards to the feet, so as to bring it between the sick man and the sheet to be removed, afterwards drawing downwards the latter. This requires a little practice, but if neatly done the patient may lie covered during the whole changing.

**Draw-Sheets.**—In cases where patients are unconscious, draw-sheets should be placed under them ; these are sheets folded lengthwise twice or thrice, to the width of about four feet, to cover the bed under the buttocks and thighs. Just enough of the folded sheet should be passed under the man to cross the bed, the rest being kept rolled up and pinned, like a roller bandage, at the side of the bed ; any soiled portion may from time to time be drawn away from under, the patient sponged clean, and a dry length of the rolled up part pulled under him.

## CHAPTER VII.

### HEALTH AND ITS PRESERVATION UNDER ARMS.

THE conditions under which recruiting for the regular army and for the volunteer forces are carried out differ very widely.

The army recruit undergoes a most stringent physical examination, or rather set of them, for he is always twice, and sometimes three times, tested as to his soundness of wind and limb. The following figures may prove interesting, as showing the thoroughness of the test:—In the year 1884 the rejections numbered no less than 27,888, being almost 417 in each 1000 examined.

A volunteer recruit may join at any age from 17 to 40, and is subjected to no physical tests; although, nominally, he passes an examination, and brings a certificate from any medical man he chooses, to the effect that he is free from physical deformities, and is in good health.

From the limited service demanded of him, it is not essential that the volunteer's standard of physical excellence should in all respects equal that of the regular soldier, of whose powers of endurance much is expected in the way of foreign service, night exposure, and arduous drill exercises, and I do not advocate a recruiting examination for volunteers so stringent as for admission to the regulars; but, from personal knowledge of the number of men rendered non-effective by such limited calls upon their physical resources as a twelve miles' march, a stiff field day, or a week's exposure to wind and weather in camp, I think that some more systematic entrance tests should be instituted.

As a means of promoting health, especially to dwellers in towns and cities, I know of none more useful than joining a volunteer corps. Apart entirely from the advantages of pleasant social intercourse, the beneficial discipline and love of order which membership brings with it, are of immense benefit to a youth passing from boyhood to manhood, and from the latter period to middle-age the influence for good on nerve and muscle of drill and field exercise are equally great. Ordinary drill is in itself a healthful physical schooling; the straightening of the spine, expansion of the chest, and development of muscle, from setting-up drill, and from the rifle and bayonet exercises, are of immense benefit to growing youths as a substitute for the out-door sports which many of them have to leave behind with their school days; and to those who delight in greater muscular exertion, artillery drill offers itself.

Added to this, most corps with headquarters in towns have their schools of arms, open for winter courses of gymnastics; their cyclist sections, for enthusiastic wheelmen; signalling and ambulance parties, for those studiously inclined; to say nothing of theatrical and musical societies, and other organisations for the promotion of pleasant social life regimentally.

**Camping.**—The benefits derivable from camps of instruction for volunteers are dependent upon conditions of weather. A week in summer under canvas is enjoyable, and of benefit to health, and of the utmost value for drill purposes, if the days are dry; but far otherwise when wet. In the latter case the whole camp becomes a swamp, the men are confined to damp tents; waiting for the rain to cease; and the enforced inactivity, coupled with the depression of spirits caused by the excessive moisture of the air and earth, are all prejudicial to the physical well-being of the men, for the most part but little accustomed to rough it.

To be exposed to weather of all kinds is no doubt good military training for the regular soldier, but then a wet week

in camp for him is compensated for by successive weeks of dry weather ; whereas, in the case of the volunteer, the time wasted by countermanded drills is a serious loss both to efficiency and to health.

It should be taken as a standard rule, that a volunteer should give up all thought of going in to camp unless he has been in thoroughly good health for at least the previous three months ; for, unless this be the case, the totally unaccustomed change in his living and surroundings are sure to tell upon him for the worse. The same holds good in the case of the Easter mobilisations and Whitsun marches, although in a lesser degree, for in these latter the tax upon his bodily powers is not so great.

**Clothing.**—The kit to be taken into camp, and which is always notified in regimental orders, I need not refer to more particularly, except to say that flannel underclothing should always form part of it, and that linen or cotton should never be taken. A double set of flannel, or merino, for underwear in the day, and a flannel sleeping-shirt and trousers, are indispensable ; to these may be added a pair of woollen socks, and some sort of cap of the same for sleeping in on chilly or damp nights, and a flannel belt, about twelve inches wide, to wear round the waist next the body ; a fair-sized sponge, some Fuller's earth or starch powder, and vaseline in small quantities, and such useful trifles as soap, shirt-buttons, pins, needles and thread, and pocket scissors.

*Boots* should be in duplicate, one pair rather more heavy than the other for marching and for wet, the second as a change ; great discomfort is caused by taking only the pair a man goes down to camp in, and often illness by wearing the next morning the half-dried boots of the day before. Marching boots should be square in the toes, broad in the tread, and have thick soles and no toe-caps, and it is almost needless to state should be laced up and long enough in the foot. I remember two instances in which men actually



went out at Easter wearing elastic-side boots!—neither of them marched far before applying at the wagon to be carried. They should also be roomy enough to admit of an in-sole, as after a first day's long march the feet invariably swell, and unless this precaution be taken, a man may find himself next morning in the unpleasant predicament of possessing a pair of feet "too big for his boots." A pair of running shoes, with indiarubber soles, or of light leather, will be found quite a luxury after a stiff day's work, and take up very little room in packing.

**Illhealth** in camp is caused as much by ignorance of some of the elementary principles of camp life and conservancy as by anything else. It may not be amiss to remind the novice that before turning in for the night all the tent ropes should be slackened a little; if this precaution be not taken before morning the tent may fall down about the sleepers' ears; the night damp or rain sometimes contracts the ropes so much that the tent-pegs are drawn out of the ground. Beating down the tent floor, sweeping, and keeping the trench round clear, I have alluded to in a former chapter; all these apparently trivial details are really most important, as without their observance no bell-tent can be kept wholesome; after the night the curtain must be rolled up all round, and no matter what the weather is, except in the case of rain directly beating in, during the daytime the door-flap must be left open.

The common sicknesses of camp life are:—diarrhœa, sunstroke, colds, and rheumatism; and the various minor affections familiar in marching columns, such as fainting, colic, sore eyes, blistered toes and heels, and chafes of the neck, arms, or thighs.

As soon as the least symptoms of diarrhœa declare themselves, no time should be lost in applying at the hospital for medicine; neglected diarrhœa often means great prostration and confinement to bed for the rest of the week. In the case of colds, accompanied by shiverings, apply for

treatment, but adopt as many precautions against catching cold as you can, and these are some of them:—When reaching your tent after drill, or a long march, do not at once throw off your tunic and lie down to rest in shirt and trousers, but keep it on for half-an-hour to let the body cool gradually.

If an exceptionally hard day's work has been done, get out your change of underclothing, air it a few minutes outside the tent, and change entirely, hanging out to air the flannels just removed, and turning inside out trousers and tunic.

If wet through, take off boots, and socks, and clothes, rub the legs and feet well with a towel, put on a change of underclothing, fresh boots or shoes, and wear fatigue dress or night flannels.

Never sit or lie down on the floor of the tent, even if it be of the finest grass, without something under you—either some sacking, a mackintosh sheet, straw, &c. &c.

There is always more or less draught in a tent, for in hot weather its occupants are glad to loop up every inch of curtain for ventilating purposes; to avoid draughts, it is better, therefore, to rest in the shade outside the tents, but if compelled to sit within, wear a tunic or jacket, and if there is much draught throw a cape over the shoulders. At night protect yourself by wearing sleeping cap and socks, and by throwing a greatcoat over the legs and abdomen as an additional blanket.

Turn in early, so as to have time to undress comfortably, and give yourself time to turn your clothing inside out, to shake it thoroughly, and to air it outside the tent for a few minutes; by giving yourself plenty of time you will also be able to sponge the feet over with cold water and doctor them a little if sore.

If there is no straw or other stuffing for the beds, and the floor of the tent is your only mattress, scoop out in the earth a hollow large enough for the hip-joint; after removing

the earth, spread your sacking or mackintosh sheet and blanket. By this simple contrivance you will rest much more comfortably, and will relieve the bony prominence of the hip from the painful pressure of the hard tent floor.

If it is advisable to turn in early, it is yet more so to turn out betimes in the morning. Reveillé in summer is at five, except on special occasions, and breakfast<sup>1</sup> three hours later. There is much to do before breakfast, and if you wish to do it in comfort turn out before reveillé; it is easy to wake early on a fine summer's morning, and the loss of a half hour or so under blankets is amply made up for by the extra time you will have in which to make a comfortable toilet.

Do not come to the conclusion that you are afflicted with rheumatism if your joints ache upon rising in the morning; this is probably stiffness, the result of lying in a cramped position, or on a bed not quite so soft as that usually occupied by you. If stiff, get outside as soon as possible, swing the arms round from the shoulders, as in setting up drill, touch the toes several times, bend up the legs at the knees, mark time at the double, and finally double round a few of the tents, and by this time your aches, if due to stiffness, will probably have ceased to exist.

That life in a bell-tent should be at all bearable, the most scrupulous cleanliness of person must be observed. The other occupants of a tent should make it decidedly hot for any man who, under pretence of being "afraid of catching cold," fails to make the whole of his skin and a bucket of water thoroughly acquainted with one another daily. Be careful to sponge the whole body over with water in the morning; a well-sponged skin means health and comfort for the rest of the day. Have the hair cut before going into

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<sup>1</sup> Arrangements are usually made whereby the men may have a cup of coffee and biscuit soon after reveillé before early parade.



camp, and leave off using any abominations such as pomatum or oil, which in spite of all that hairdressers may say, are not only unnecessary, but positively injurious, greasing the head being a fruitful source of disease in the scalp, and of baldness ; always lather the scalp well with soap, and rub it, and the whole body briskly dry with a rough towel.

Marching along hot and dusty roads frequently causes much irritation of the eyes and skin, which, combined with the action of wind and sun on tender skins, produces inflammation. It is here that a little vaseline, cold cream, or a block of cocoanut-oil, comes in so usefully ; on getting back to the lines anoint the chafed or sunburnt skin with one or other of these lubricants, allowing the application to remain on for 10 minutes or so, then you may wash with soap and water ; if the luxury of warm water is attainable, so much the better. I think one of the most useful soaps to carry is Wright's coal-tar soap ; it is very soothing to an inflamed skin, and is of use also in shaving.

The eyes should not be bathed in hot water, but in cold, and if at all bloodshot and the sight misty, apply to the surgeon for relief.

In marching out, if you desire to preserve your wind, abstain from smoking going along, but wait until a halt is called, no halt lasts for less than five minutes, and there is one every hour.

Cold tea, with a little lemon or orange juice squeezed in, is the best drink to carry. In the matter of thirst, an old soldier knows how to husband his water-supply, uses his water-bottle sparingly, and is content to moisten his tongue with a teaspoonful or so of its contents rather than indulge in large draughts. The more you drink on the march the less satisfied you will feel, and upon an empty stomach you are very likely to bring on an attack of colic. Beer and spirits and water should never be taken out ; they are both useless in quenching thirst, and in fact distinctly promote it :



the same of milk, which, though an excellent drink as an article of diet, does not relieve thirst for long.

It may be taken for granted that the camp water supply in the water-carts or stand-pipes is wholesome, and water-bottles should only be filled there. Avoid stooping down to drink from wayside rills, streams, wells, or ponds, no matter how clear and sparkling the water may appear ; rather suffer thirst than touch such water, especially on the march. Most serious sickness may be the result, two varieties of which I need only mention as warnings, namely, diarrhœa and typhoid fever. Bearers should warn and prevent men from drinking wayside water.

As previously stated, attacks of sunstroke are not uncommon ; there are always some who may be overcome by the heat of the sun, but there are others who might escape were their habits in camp more rational. Immoderation in the consumption of alcoholic beverages overnight at tent reunions or camp-fires is the sure foundation for either a restless night or one of slumber, deep truly, but unrefreshing, resulting in the morning in a leaden head, relaxed throat, and parched tongue, deranged stomach, with giddiness, and unfitness for exertion. A very little exposure to the sun's rays is quite sufficient, and the result that the over-night revellers drop quickly.

When helmets are worn, as simple devices for warding off the attack, the insertion of a cabbage leaf, wet paper, or wet handkerchief in the crown may be mentioned. Commanding officers should never order parades in forage-caps in the summer sun ; there is absolutely no protection to the nape of the neck afforded by any forage-cap in our service : and as helmets are usually worn a size too small from a false idea of smartness of appearance, not very much protection is derivable from them, but always, of course, much more than from a forage-cap. If one may dare to suggest the fact to our military Worths, it is quite possible to provide a universal pattern forage-cap of cloth possessed of collapsing peaks of

sufficient size to shade both the eyes and neck, the peaks to be pulled down and used in the sun, and tucked in for ordinary wear, and this without making the cap too large for smartness or for easy stowage.

Footsoresness, even in the army, is a source of much trouble. The best troops are those who can march, and old soldiers always pay particular attention to the state of their feet. Boots I have alluded to in a former paragraph. *Socks* for marching in should be of merino, large enough to fit comfortably, but not so loosely as to form creases anywhere pressing on the foot. Choose them with seams as little prominent as possible, cutting off fag ends ; wear them wrong side out, and change them when coming in after marching. Next day wear another pair. To grease the feet plentifully is the best preventive against blisters, but this means washing the socks frequently, no easy matter when in camp for only a few days. As a substitute, rub the feet over with a moistened cake of soap, and also soap the sock before putting it on. On coming in, remove the socks, and wash the feet well with cold water and soap. Any sore place may next be covered with a little ointment spread on lint ; if there are any blisters, it will pay you to remain lying down with the feet bare, and after letting the fluid out of the blisters,—do this only by the smallest prick with a needle at a dependent part of the blister sufficient to empty it—dress them with wet dressing, *i.e.*, simple wet lint. Next morning, after washing, wear lint and ointment, but be careful to report your feet sore if there is any pain in walking. If you have your foot dressed some distance from camp, lose no time in getting your boot on again, as from the swelling of the foot after a few minutes, you may have to hobble back with one boot in your hand.

When billeted at a seaside place in the early part of the year, if you are unaccustomed to sea-bathing, you had better not indulge in it. At other seasons a daily bathing parade is usually arranged ; the water should not be entered on an

empty stomach, nor immediately after a heavy meal ; 10 to 15 minutes even in hot weather is quite long enough to remain in the sea at a time.

At Eastertide, in our climate, though the days may be bright and sunny, after sunset the evenings are usually cold. In walking about the town in the evening, after a fatiguing day, if you do not wear great-coats, put on a second flannel shirt under the tunic, or that most useful article, a jersey or cardigan waistcoat. A little coddling of this kind can do no harm, and may avert a sharp attack of pleurisy or inflammation of the lungs.

Before going to drill when at home, always give yourself time to take a sufficient amount of food, those hurrying from business or coming long distances often omit to do this, and have to fall out in consequence. Pastry of any kind, fresh bread, hard-boiled eggs, and beer, are all bad articles of diet to drill upon.





## APPENDIX TO PART II.

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### Fresh Air and Ventilation.

THAT the human body may continue in a state of health, it is absolutely essential that fresh, that is pure, air should be constantly supplied to it. Pure air is a mixture chiefly of the gases nitrogen, oxygen, watery vapour, and carbonic acid.

Oxygen, as has been elsewhere stated, in the act of inspiration, enters the body to nourish and purify the blood, and, in the act of expiration, the body gets rid of a large amount of waste, foul material, in the shape of carbonic acid gas and other impurities, commonly spoken of as organic impurities. Air, therefore, containing an insufficient amount of oxygen does not, when inspired, thoroughly aerate or nourish the blood, the health of the body suffering accordingly,—waste or foul, and therefore poisonous, substances accumulating in it; and when the supply of oxygen is entirely suppressed, as in drowning or strangling, death by suffocation follows.

Air which has been once breathed is unfit for breathing a second time, hence the vital importance of changing the air in living and sleeping rooms, and supplying fresh air containing enough oxygen. The breath expired by the lungs contains about 120 times as much carbonic acid as fresh air, and although carbonic acid gas in this quantity is not in itself directly poisonous, in air breathed out by the

lungs there are always known to be other (organic) impurities co-existing with it, and the amount of carbonic acid present in the air of a room is therefore taken as an indicator of its freshness, or the reverse.

A man breathes in and breathes out between 16 and 17 cubic feet of air in an hour, and as this air contains about 120 times too much carbonic acid (and other impurities) to render it fit to breathe again, about 120 cubic feet of fresh air must be added to each cubic foot of foul air; so that at least 2040 cubic feet of fresh air an hour are necessary for each individual for the purposes of ordinary respiration.

This amount, however, is insufficient to prevent an inhabited room from smelling offensive, and, to keep the air fresh, it has been found that, at least, 3000 cubic feet of fresh air must be supplied to each individual hourly. From the foregoing, it will be gathered how important to health is a constant supply of fresh air, or, in other words, of free ventilation. That 3000 cubic feet per head per hour may be supplied without unpleasant draught, no lesser space than 1000 cubic feet should be allotted to each individual. In barracks this much individual air space has never yet been provided, and under canvas the cubic space for each man is woefully insufficient. The circular or bell tent has a cubic space of 672 feet. As it is seldom tenanted by less than twelve men, and, in time of war, often by sixteen or eighteen, further comment upon the insufficiency of cubic space it affords is needless. The ventilators in its sides are, as air outlets, practically worthless, and it is therefore essential to keep the curtain rolled up all round, and the door flap continually open, during the day, weather permitting, to ensure the substitution of fresh for stagnant air; and in exceedingly close weather, with no movement of wind, the only way of thoroughly changing the air inside is to strike the tent and re-pitch it after a while.

**Infectious Diseases.**—Except during long periods of mobilisation, it is hardly probable that bearers acting as

hospital orderlies will meet with cases of infectious disease. There are some few points about these disorders which come under the heading of "useful information," a knowledge of which may at some time be of use on service, and which, therefore, as briefly as possible, will be mentioned here.

The term "infectious diseases" is now applied to the more common infectious fevers, namely :—

Scarlet Fever or Scarlatina,	With, usually, a well marked rash.
Diphtheria, . . . .	No rash or eruption.
Enteric or Typhoid Fever,	Eruption very slight.
Measles, . . . .	Rash well marked.
Smallpox, . . . .	Eruption usually marked.
Typhus Fever, . . . .	Eruption very slight.
Erysipelas, . . . .	Eruption limited to part affected.

The first three, with the last, Erysipelas, are the more common infectious diseases met with in military life.

Infectious diseases have a tendency to spread from the affected person to others over extensive areas. When this takes place, it is spoken of as an "Epidemic" of Smallpox, of Scarlet Fever, &c. &c.

It is now the generally accepted theory that these diseases spread by very minute particles proceeding from the bodies of those affected. These minute particles we may call germs for convenience sake. These germs are themselves possessed of life, are capable of a certain amount of movement, and of increasing very rapidly in numbers. They are sometimes called microbes. Whether they themselves are the poisonous material of each fever, or whether they are only the disease carriers, the means by which the disease poison is carried from one to another, it is not necessary here to discuss.



Acting upon this theory, then, it is clear that there are two most important things to attempt to do.

(*a.*) To limit the spread of the Infective Poison.

(*b.*) If possible, to kill or stamp it out.

In both the Navy and Army extreme care to limit the spread of infectious fevers is always taken. The outbreak of epidemics amongst troops, or in a ship's company, is, it is scarcely necessary to say, a serious misfortune, especially on active service.

The first step taken is always to isolate the patient, that is, to remove him as far away as possible from the rest, and to a place to which the others have not access, and to detain him there until the fever has terminated, and after that again, a sufficiently long period to render his rejoining his comrades safe to them. During his stay in isolation quarters he must, of course, be nursed.

Those nursing him are liable to become the carriers of the fever poison themselves, if allowed access to the main body of troops. Very stringent regulations, therefore, are drawn up under this head to prevent unnecessary visiting from the isolation hospital to the camp, and *vice versa*.

The disease may be given to another either by the patient's breath, as in typhus ; by the excreta as in enteric ; by particles from the skin and throat as in scarlatina ; from the throat and breath in diphtheria ; from the crusts and dust from the smallpox eruption ; also from the skin and lungs ; and, in measles and erysipelas, from the breath also.

Other agencies which may carry the fever poison are the breathing in of the air surrounding the patient, contact with the various discharges, contact with clothes, and partaking of food or drink left in the sick-room. In the nursing of infectious cases, cleanliness, in its widest and fullest meaning, is the great safety guard against catching the infection. In cleanliness, of course, must be included ventilation, not of the ordinary limited kind, but unlimited ; there can never



be too much fresh, pure air circulating round the bed of a fever patient.

It is certainly more by a scrupulous observance of the laws of Health, of which cleanliness and ventilation are the chief, that infectious diseases are stamped out, than by the use of special chemical substances known generally as disinfectants.

Nevertheless, disinfectants play a most important part in the proper management of infectious fevers. It is claimed, and with good reason for some of them, that they actually have the power of combining with the fever germs, and either of killing them outright, or of converting the germs into harmless particles. Disinfectants possessing this desirable killing power are known as germicides.

### Germicides, Disinfectants, and Deodorants.

The most reliable germicide is steam at  $212^{\circ}$  Fahrenheit. Steam penetrates articles of clothing more thoroughly than dry heat, and should be employed under pressure.

Next in efficacy comes dry heat at  $220^{\circ}$  Fahrenheit. Disinfection by either of these means requires special apparatus, which would only be met with in a town or standing camp or barracks. The infected articles of clothing, everything worn by the patient, and the bed linen and bedding can be disinfected in a few moments by the application of steam, and of one hour in the case of dry heat.

These methods, of course, are all very well in the way of clothing, &c., but in what way, and by what means, is it possible to disinfect (*a*) the room in occupation by a fever case, and (*b*) to disinfect the room or tent after its uses as a sick ward are at an end?

*During the occupation of the Patient* the freest ventilation must be insisted upon, the utmost cleanliness both of patient, nurses, clothing, bedding, walls, floor, and furniture,—that is the first thing. Next, a systematic attention to

the necessity for immediately removing all discharges of whatever nature coming from the patient, either from the eyes, nose, throat, bladder, or bowels, right out of the sick-room in a special receptacle, in which is some disinfectant powder or solution, and which is provided with a proper cover.

Among the more simple means of purifying the air round the fever bed may be mentioned the exposure of **Charcoal** (animal) about the room in saucers or trays, or hung up here and there in muslin bags. These should be replenished with fresh charcoal once in three days.

(a.) Pans of fresh water, into which a few drops of **Carbolic Acid** have been poured, and even fresh water alone. These pans should be refilled fresh night and morning.

(b.) The use of **Chloride of Lime**, in small quantities, mixed with water, and placed in saucers here and there, and, in a like manner, solution of **Permanganate of Potash**.

(c.) There are also now largely in use various patent disinfectant fluids, of which I can mention very favourably Jeyes', and the various compounds of the Sanitas Company.

For disinfecting the excreta, rags, and handkerchiefs fouled by discharges, &c. &c., a solution of **Bichloride of Mercury**, 1 ounce of the mercury to 1 gallon of water should be put into the utensils in which soiled rags, &c., are put for carriage out of the sick-room.

In most hospitals an arrangement of sheets kept moist with carbolic water, and hung over each fever ward door, is the custom.

All bed-linen, &c. &c., should be soaked in the bichloride of mercury solution above named for twenty-four hours.

Other solutions used in the same manner are :—

Carbolic acid, 2 parts to 100 of cold water.

Chloride of zinc, 1 part to 240 of water.

Sulphate of zinc, 1 part to 120 of water.

If a disinfecting oven is available, this steeping may be dispensed with, unless the clothes have to lie about half a day or so, then they should be steeped until they can be disinfected by heat.

After steeping, the clothes should be hung out to dry in a field or large open space, and should be boiled afterwards in specially reserved coppers, with chloride of lime in the water.

On no account should the clothes used, bed-linen, &c., be left in the tent or room, but outside, freely exposed to the air, if they cannot at once be removed to the spot set apart for disinfecting.

For handkerchiefs for the patient's use, soft small squares of linen rag should be substituted. These are to be disinfected after use with mercury or carbolic solution, and then to be burnt as speedily as possible.

The medical officer in charge will, no doubt, issue special ward regulations as to the bathing or sponging of the patients with water in which some disinfectant has been mixed; also, as to the ablution of the orderlies on nursing duty, and as to the special dress which they should wear whilst on duty. The latter should invariably be of calico or linen, and should be worn over the uniform in or about the fever tent or ward.

When practicable, a tent after use for a fever case will be disinfected by steam. When this process is out of the question, it will be disinfected by fumigation.

**Fumigation** of sick-rooms or tents *after* the patient's removal is usually accomplished by the use of the following chemicals, by which fumes, or gaseous vapours having strong disinfectant or germicidal properties are evolved:—

Fumigation by **Nitrous Acid**. Into an iron pail or earthenware pan put half an ounce of copper filings or wire, one ounce of strong nitric acid, and two of water. Red fumes will be given off, which are very irritating to the eyes, nose, and lungs.



By **Chlorine**. Into a pan put a cupful of chloride of lime, half a cupful of strong sulphuric acid (vitriol), and about a cupful of water. Stand clear of the pan whilst doing this.

By **Sulphurous Acid**. An iron tray or pail, in which are some burning coals, should be placed in the centre of the floor, and one pound of sulphur (brimstone) in small lumps thrown on. At least one pound of brimstone for each 1000 cubic feet of room space should be used.

That the fumigation may be thorough, before commencing, close windows, fireplace, ventilators, and all chinks and crannies by which air may enter. Chinks may be closed by pasting over them strips of paper; the fireplace must be stuffed or boarded up. Retire from the room as quickly as you can, shut the door, stuff up the key-hole, and cover up the chink below the door; leave the room closed for three or four hours. Take all precautions against fire; the receptacle for the coals should stand in a pan of water. In fumigating a tent, peg down the curtain, and close the ventilators and door-flap. Leave open the door for an hour before you re-enter, and then make straight for the window, which open at once, and in entering the room the mouth and nostrils should be covered with a handkerchief.

When neither steam nor dry heat is available, and the disinfection is by fumigation, a bed must be disinfected by having the ticking or covering ripped open, and all the stuffing, be it hair, wool, flock, leaves, or straw, taken out. If the stuffing be of straw or leaves, burn this at once. If of either the three former, it must be teased out and spread about before fumigation.

**Deodorants**.—Any substance which will remove or disguise an offensive smell is a deodorant. Thus, eau-de-cologne, lavender-water, burnt brown paper, vinegar, tar, are all deodorants; but it does not by any means follow that they are *disinfectants*.

The simplest deodorant is fresh water. This left about



a sick-room in open pans and frequently changed is highly efficacious.

Charcoal, as before described, chloride of lime, Condyl's fluid, solution of coal tar, turpentine (in minute quantities), are all excellent deodorants; but about the most pleasant of all is eucalyptus oil, and next to that sanitas. The aroma of each of these is very delicate, and not likely to create a feeling of nausea in the patient. Many other substances might be enumerated as deodorants—viz., dried earth, peat, chloralum, pine sawdust, iodine, ammonia, vinegar, and the various scents and perfumes.

### The Administration of Medicines.

Medicine given by the mouth is in one or other of the following forms—Draughts, Powders, Pills, Tablets (or tabloids), and Electuaries (of pasty consistence).

The first duty of those to whom the administration of medicine is entrusted is to read the label or other printed instruction issued with the medicine; to measure out accurately the doses (quantities) ordered, and never to guess them.

A measure glass or spoon is almost invariably available, and is marked either in drachms and ounces only, or with the words teaspoon, dessert-spoon, and tablespoon also.

1 drop	equals 1 minim.
1 teaspoonful	„ 1 drachm.
2 teaspoonsful	„ 2 drachms or 1 dessert-spoonful.
4 teaspoonsful	„ $\frac{1}{2}$ ounce or 1 tablespoonful.
2 tablespoonsful	„ 1 ounce.

A draught may be from  $\frac{1}{2}$  to 2 or more ounces, as directed. When a draught is prescribed, usually the whole of it is ordered to be taken at once. When several draughts are dispensed by the apothecary for the day's supply, they are placed in a bottle sufficient to hold 6 or 8,

and then constitute a mixture, one or two tablespoonsful of which is ordered to be given every 2, 3, or 4 hours, or so many times a day, as the case may be.

As a general rule, all mixtures may be shaken up before the dose is measured out.

As in feeding, the patient's head and shoulders should be well raised before his dose of mixture is given to him.

**Powders** are usually mixed with water before administration.

**Pills** and tabloids can be the more easily swallowed if the patient be given a draught of water at the same time.

Electuaries, being of a soft pasty consistence, are swallowed without difficulty.

**A Gargle** is really a lotion or wash for either the gums, mouth, or throat. It should be used, as a rule, once every half-hour or more.

**Lotions** are applied externally, on lint or some other such material, and always have, or should have, a distinguishing label marked "poison," or "not to be taken," as they frequently contain poisons; care should be taken to keep them well apart from the bottles containing mixtures.

**Liniments and Embrocations** are medicated fluids, usually soapy or oily, applied to the outer surface of the body and rubbed in with the palm of the hand. They are usually distinguished by a poison or other danger label, and must be carefully kept apart from the mixtures.

**Emetics** are drugs given by the mouth to produce vomiting. The more commonly used are mustard, ipecacuanha, and sulphate of zinc, mixed with water. Of mustard 1 tablespoonful to a tumblerful of warm water; of ipecacuanha, 1 teaspoonful, water the same; of sulphate of zinc  $\frac{1}{4}$ -teaspoonful, water the same.

**Enemas.**—When either liquid nourishment or medicine (usually aperient medicine) is injected into the lower bowel, this is called giving an enema. A Higginson's or

other pump-syringe is used to throw the fluid into the bowel. The patient is made to lie on his side (left), the buttocks at the edge of the bed, and with the knees well drawn up. The nozzle of the syringe, well warmed and oiled, is carefully passed through the aperture of the anus, and the buttocks held together with the left hand of the sick-attendant, whilst his right is occupied in compressing the ball of the syringe, and thus throwing or injecting the fluid to be administered into the rectum or lower bowel. A soft towel or napkin should immediately be pressed over the anus as soon as the nozzle of the syringe is withdrawn, and held there for some ten minutes.

### Removal of Boots in Injuries to the Ankle or Foot.

The rule not to disturb an injured part by removing the clothing holds good in most injuries to the ankle or foot, but in some cases of gunshot, or other injury causing laceration and much crushing of the part, it will be necessary, in giving first assistance, to remove the legging and boot. This is an operation requiring much delicacy of handling, especially in the case of a mounted man's long boot. Under no circumstances whatever is a boot to be pulled off. It must be cut away.

The cardinal point to bear in mind in injuries to the ankle and foot—as indeed in those of any other part where there is a suspected fracture—is to disturb the parts as little as possible. To this end, one bearer unassisted should never attempt the removal of a boot; at least, two pairs of hands must be employed, one man devoting his entire attention to steadying the leg and foot, while the other cuts the leather.

In the case of a cavalry boot, the spur-leather must be first unbuckled, and the spur gently eased off; avoid any jerking in doing this. Next, with a scissors, commencing at the upper part of the leg of the boot, cut the leather as



straight as possible down the front, in a line over the shin, if possible, to the instep. Go very cautiously here, lifting up the leather with the left while cutting with the right; continue the cutting right down to a point at the sole, between the great and second toes. By this time some idea of the extent of the wound or other injury will have been arrived at. By drawing downwards by the heel and the end of the sole the boot ought to come off readily, but, if not, do not hesitate to sacrifice it, but make a cut to the right and a second to the left where the upper is joined to the sole at the toe end of the boot.

In an infantry boot, do not wrench the leg about by trying to unbutton the legging, unless this can be done very easily, but cut the legging down in the same way as in the cavalry boot; next, set to work on the boot itself. Cut the strap or laces, next cut down the tongue and upper to the toes, and, if the boot will not come away easily, make two other cuts at the toes as above directed.

Stockings or socks must be removed in like manner; never pull them, but cut them off.

On actual service it is important to remember that new clothing is not readily procurable, and that therefore when it becomes necessary to cut away a boot, the cutting should be done in such a manner as not to render the boot entirely useless. If the boots are cut in the way above directed, they will be available for use again with the help of laces or string to bind them on.

**Bed-sores.**—(a.) In hospitals the word bed-sore applies to sores which form on the bodies of patients who are bed-ridden and helpless. A bed-sore is really the *death* of a part from mechanical compression. The patient is helpless, lying for days in one position, and in certain dependent parts of his body continually pressed upon by his bed,—for example, his heels, elbows, buttocks, sacrum, shoulder-blades—the circulation of the blood becomes first obstructed, and, finally, arrested completely, the consequence being that



the part pressed upon mortifies or dies. This, of course, is an example of an extreme case. In other instances, Bed-sores (*b*) are local inflammations of dependent parts of the surface of the body, and are caused by undue pressure by the bed-clothes upon a tender or irritated skin. A crease or fold in a sheet, a crumb of bread, a feather, bit of string, almost anything, may cause a bed-sore, if it causes pressure upon the skin of a patient lying in bed long in one position. Especially should the skin be in an irritable condition from involuntary passage of urine, excessive perspiration, or inefficient washing.

The last named, indeed, is by far the most frequent cause of bed-sores in nursing, both professional and amateur, and in this I include *inefficient drying of the skin after washing*.

*Treatment* consists in reducing, as far as possible, the pressure over the part. This, of course, especially in surgical cases of fracture, is almost impossible. Still, much relief may be given by great attention to the condition of the skin by careful washing, drying, and dusting the irritable surface with prepared starch powder, Fuller's earth, or zinc oxide, subsequently protecting the part with some lint, carefully adjusted, and a pad of cotton wool over all.

In some cases, over a bony prominence in a patient much emaciated, it is a good plan to carefully apply strips of leather-backed adhesive plaster.

If seen early enough, the irritated skin may be painted over with an application called **Collodion**, which quickly dries, forming a protective film over the part.

**Yellow Soap for Bed-sores.**—Warm thoroughly a cake of good yellow soap before a fire, to soften it. Turn the patient over on his side, and gently rub the cake of soap—its softened portion—over the affected part. Rub for about one minute, night and morning.

**Chilblains** are also local inflammations of the skin in parts of the body where the circulation may be feeble,—ears, nose, fingers, or toes,—and may be caused by sudden

application of great cold or heat, or by a rapid change from one to the other; for instance, by warming the feet too quickly at a fire coming in from a cold railway journey, or by washing the hands in very hot water in winter. Painting over the inflamed surface with collodion often effects a cure.

When the inflammation has proceeded so far as to cause a sore, this ulceration must be treated with water-dressing, or with lint moistened with lead lotion, a preparation popularly known as Goulard Water. Poulticing—a very frequent practice, by the way—should be strictly avoided.

**Sticking-Plaster** is frequently called for at a minute's notice, for scratches and minor cuts sustained at a field-day; the stock of isinglass plaster, or other readily applied variety, may be exhausted, and nothing left but the ordinary diachylon, or sticking-plaster. This variety has the one great disadvantage that it requires heat to prepare it for use, and the means of heating it are usually, of course, entirely absent. A very good substitute for a hot water can will be found in the bowl of a lighted tobacco pipe; the strips of plaster may easily be warmed into adhesiveness by placing the calico side next a lighted pipe—only very small strips, of course, can be heated in this manner.

**Improvised Hammock.**—What is known in hospitals as the improvised hammock is the method of lifting a helpless patient off a bed, in the recumbent position, by means of the sheet and blanket under him. The sheet and under-blanket are both to be loosened from the edges of the bed.

The edges of both sheet and blanket, throughout their entire length, are next to be lifted up and brought together in the middle line above the patient, and stretched tightly.

Thirdly, the edges of both sheet and blanket must be rolled from above downwards, forming a long sausage-like roll, until this roll almost touches the patient's body. By grasping this roll firmly with the hands, the patient may be

easily moved from one bed to another. A pole, broom-handle, &c. &c., may be rolled into the roll at its commencement, and its introduction will much simplify the operation. It may be as well to remind the reader, that this form of 'lift is on no account to be made use of in the case of a broken limb or severe wound, but only in helplessness from other causes, such as fever, rheumatism, or some such disorder ; and that at least two attendants must lift the patient.

**Changing Bed Coverings.**—Quilt, blankets, and upper sheet may be quickly changed, if requisite, by the following method :—

After untucking the upper bedclothes, lift off the quilt and upper blanket, leaving second blanket and upper sheet still in their place.

Spread out the clean sheet over these, next over this a blanket and quilt.

Let one attendant grasp firmly the edges of quilt, blankets, and new sheet, standing at the right of the bed.

Let No. 2 attendant, standing at the left side, grasp the sheet and blanket next the patient, and pull them away, evenly and steadily, towards himself, keeping his arms well extended.

**Rolled Greatcoat, German method** (Fig. 42).—In the German infantry the greatcoat is rolled, and carried on the back, encircling the valise or knapsack, presenting somewhat the appearance of a ship's life-buoy.

For those on bearer duty, with stretchers, it is especially advantageous.

**Field, or Broad Arrow, Kitchen** (Fig. 43) consists of three trenches converging to a point, with their mouths connected by a transverse trench, and a flue, 14 feet long, connecting these trenches with a chimney, 5 or 6 feet high, formed from the turf cut from the top of the trenches, and other sods obtained for this purpose.

The kitchen is constructed as follows :—A picket is driven



to mark the centre of the chimney, and a square of 3 feet marked off the ground, with a picket as a centre, for the base of the chimney.

The main trench, 26 feet long, is next traced, and a picket driven at a distance of 14 feet from the centre of the chimney, to mark the head of the centre trench, which is 12 feet long and 9 inches wide. Two other trenches are traced of similar dimensions, one on either side, converging on the head of the centre trench, with their outer ends at a distance each of 5 feet from the central one. Each trench



FIG. 42.—Rolled greatcoat, German method.

has a splay mouth, 2 feet wide and 2 feet long. A transverse trench, 18 feet long, 2 feet wide, and 21 inches deep, connects their outer ends.

One man excavates each trench, which is 18 inches deep at the mouth, this depth carried for 18 inches inwards, gradually diminishing to 6 inches where it enters the flue. Another man cuts out the bottom of the chimney, and builds it up with the sods cut in construction of the trenches. The third man excavates the draught, or flue; which is 14 feet long, 9 inches wide, and 6 inches deep,



and, as soon as the trenches are dug, he bores a tunnel from the head of each into the flue, taking care that the openings from the outer tunnels do not face one another (which would interfere with the proper working of the draught), then covers the flue with sods or turf, from the top of the trenches to the chimney. The other two men excavate the transverse trench, and provide turf for the construction of the chimney. To cover the trenches, and leave apertures for the kettles, sods, grass side downwards, should be placed across, or stones, hoop-irons, sticks plas-

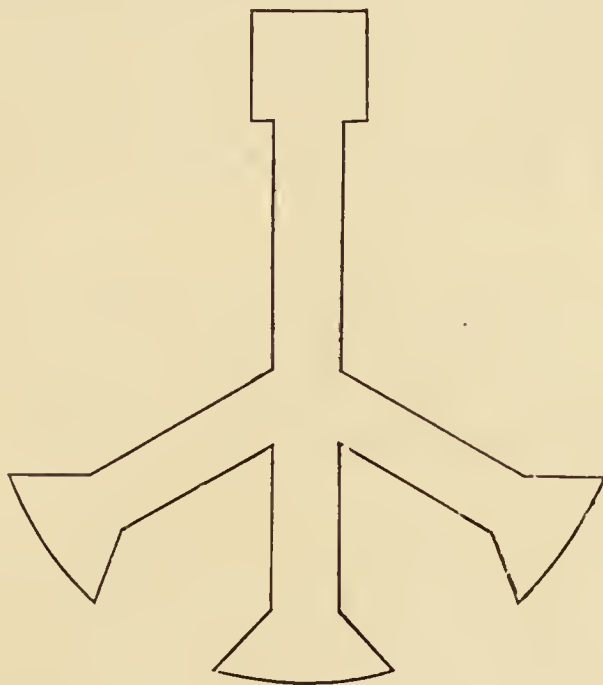


FIG. 43.—Field kitchen.

tered with clay, and all interstices closed with clay (*Medical Staff Corps Manual*, 1888).

### Cooking-place and Field Kitchen.

*Cooking-place.*—If the encampment be only for a night, one or two trenches, according to the number of kettles, should be dug 6 feet long, 9 inches wide, and 18 inches deep at the mouth, and continued for 18 inches into the trench, then sloping upwards to 4 inches at the back, with

splay mouth pointing towards the wind, and a rough chimney 2 feet high at the opposite end formed with the sods cut off from the top of the trench.

It will be advantageous if these trenches are cut on a gentle slope. This trench will hold 7 of the large oval, 6 Flanders, or 9 Torrens' kettles.

The large oval and the Flanders kettle will each cook for 8, or without vegetables 15, men; the small oval and the Torrens will cook for 5, or without vegetables for 8, men.

If there is no time to dig a trench, or the ground be hard or sandy, the kettles may be placed in rows 10 inches apart, and the fires lighted between them, the heat being thus applied to the sides in place of the bottom. By this method the cooking takes a little longer and requires a little more fuel.

On damp or marshy sites a wall-trench will be found to answer best, constructed as follows:—Cut some sods of turf about 18 inches long by 9 wide, and lay them in two parallel lines 6 feet long, with an interval between them of 2 feet 6 inches.

Build these walls 2 feet high for large oval or Flanders, and 18 inches high for small oval or Torrens' kettles. Lay the wood all over the bottom between the two walls. Place sticks through the handles of the kettles, and hang them over the centre with the ends of the sticks resting on the walls. Light the fire. This trench will hold about 10 Flanders, 12 large oval, 20 'Torrens' or small oval kettles.

[*Medical Staff Corps Manual*, 1888].

### Directions for Pitching a Circular Tent.

The bell-tent weighs  $44\frac{1}{2}$  lbs. complete, and consists of a circular roof, to which is a curtain 2 feet 2 inches deep,

24 bracing lines, with a runner and button to each, with 3 small ventilators at apex of roof.

1 peg-bag containing 47 pegs and 2 mallets.

1 pole in 2 pieces.

Valise and cords, &c., for packing.

A party of 1 N.C.O. and 6 men (1 file as pole-men, 1 as packers, and 1 as peg-men), will be told off to pitch the tent. Each tent squad will bring up a tent, pegs, and pole, open the tent-bag, and, in order to mark the spot for the pole to rest, drive a peg between the heels of the pole-man, who will grasp the pole; the tent will then be opened, and placed on the pole. If the tent has storm-guys, they will be fixed and the ends placed over 4 pegs driven at right angles to one another 5 yards from the pole, marking 4 corners; if

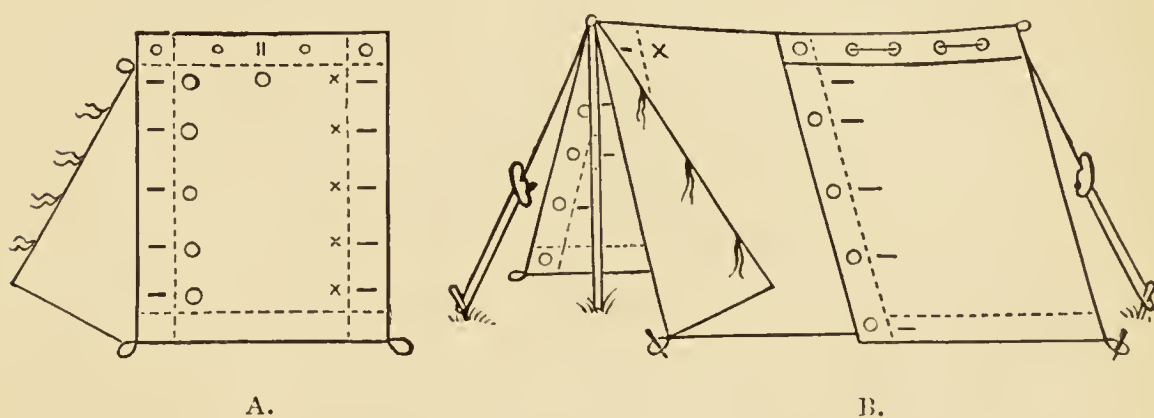


FIG. 44.—Malet's shelter-tent.

the tent has no storm-guys, the 4 red runners will be held each by a man, the N.C.O. seeing that the door points the proper way and that the fly is fastened. All being now ready, the tent will be raised, the pole-men remaining inside to keep the pole perpendicular, the guys fixed, the pegging down completed, and a trench, with a proper drain to carry off the water, dug.

**Malet's Shelter-Tent.**—Captain Malet, Northumberland Fusiliers, has introduced a very portable shelter-tent, two or three sets of which may with advantage be carried with the bearers' hand-cart. The shelter consists of stout sheeting cut into shape, as Fig. 44 A, each man carrying a portion

and two short bamboo sticks slung with the bayonet. The portions when pieced together, as in Fig. 44 B, form a good shelter for four men. This invention has the advantage of being very light, otherwise portable, and is very simple in pitching and unpitching. Each man also carries a guy-rope and runner. For a temporary shelter, half of the tent is pitched, or two portions end to end, forming a screen.

**Latrines** should be made as soon as possible after arriving on the encamping-ground. Too much care cannot be bestowed in selecting the site of the latrine, and placing it so that no filtration from it shall reach the water supply.

If the encampment be only for one night, a small

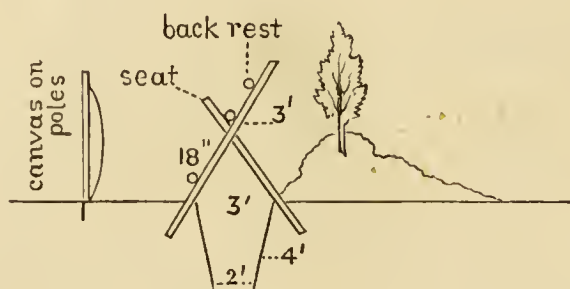


FIG. 45.—Latrine.

shallow trench will suffice, with the latrine screen around it. The trench should invariably be filled in before leaving.

If the encampment is likely to stand for any time, regular latrines should be made. The seat being a simple rough pole, the trench should be made as narrow as possible, and from 3 to 4 feet deep. A fatigue party should throw a couple of inches of earth over the soil every day. This, if carefully done, will prevent all smell.

In a standing camp a urinal should be established.

**Ambulance Wagon, "Mark V.,"** is the newest pattern, 1890, for sick transport used in the Regular Service. To casual inspection it appears very similar to Mark III.



Running down the interior, at its sides, are leather padded seats, like those in an omnibus, capable of seating ten patients sitting up. On the box seat, by the driver, two more can sit. These side seats are made in divisions, and can fold up and hook to the sides of the wagon, when its floor is needed for two patients on stretchers; as there is no seat and back-board at the tail end, the stretcher handles are immediately over the hind edge of the wagon floor. This wagon, therefore, will carry two patients on stretchers, and two sitting up inside; or, without the two on stretchers, ten sitting up, exclusive of seats for two more beside the driver. It is provided with a hinged tail-board, perforated to receive the four stretcher handles, and also with a small hanging foot-board, on which an orderly may stand up.

**Cacolets** are chair-like seats, hooked on either side of a mule pack-saddle; provided with a hanging foot-board for the patient's feet, and straps and buckles to fasten the sick men into the seats, for greater security.

**Litters** are folding stretchers for the transport of patients lying down, slung on either side of mules, camels, &c.

Each litter consists of a folding iron framework, jointed in three parts—head, centre, and foot-piece; the head-piece provided with a pillow and hood, and with a canvas bottom, or lining, stretching the whole length of the frame. For additional security there is also a side-rail, various straps, and an apron, or cover.

**Ambulance Cart, "Mark I.,"** is also a recent innovation, designed to carry four patients able to sit up, or two on stretchers.

This is a two-wheeled cart, easy of access, and to be made use of for intercommunication between camp hospitals; presumably, it is made to be drawn by either one or two horses or mules.

**Cyclists' Stretcher.**—As a curiosity in wheeled sick transport, may be mentioned the double bicycle, supporting a

field stretcher, brought out by the 25th Middlesex (Cyclists) at their last yearly inspection. It consists of two ordinary bicycles locked together by traverses, from which, and upon which, rests an opened-out stretcher. As an example of ingenuity, this wheeled litter is most clever. I do not think that I should trust a case of fractured femur to be transported by this machine, however, unless every other means of carrying failed. The stretcher hangs rather too near the ground to allow this machine to be used, except on the smoother roads; and it is impossible to lose sight of what the consequences might be to an unfortunate patient, were any obstacle, more than a few inches in height, to be passed over *en route*.

**The Bearers' Hand-Cart** (Fig. 46).—This cart is, in the

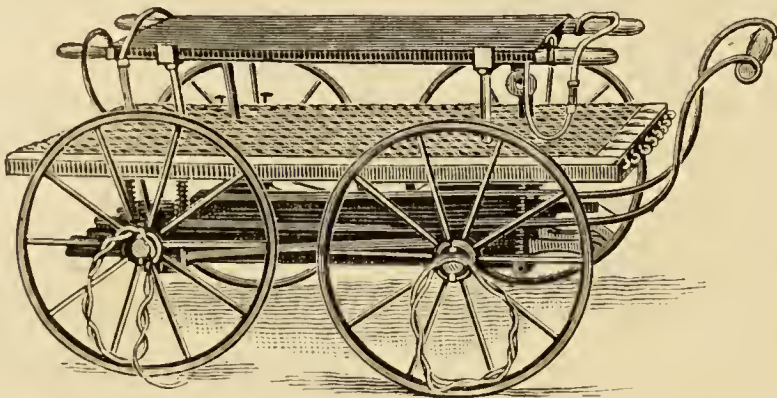


FIG. 46.—The bearers' hand-cart.

first place, a cart for the bearer section, designed to carry the kits of the regimental bearers when in the field searching for and dressing the wounded.

It is so constructed that it is also a wheeled stretcher, capable of being propelled by one man, and will carry, on emergency, two wounded; though, under ordinary conditions, it will be used for one case only.

In addition to the bearers' kits, spare rifles, five stretchers, waterproof sheets, Malet's shelter-tents, field-companion, and water-tank, are carried by the cart.

It consists of (a) a chain covered rectangular frame of wood, resting upon nine spiral bicycle springs, specially

protected ; supported by (*b*) an under carriage of four wheels.

Upon the upper framework are set four gun-metal crutches, which receive the poles of the ordinary Mark V. field stretcher (opened out).

From the hind axle spring upward and backward two curved irons, connected by a wooden crossbar, to form a handle for driving purposes.

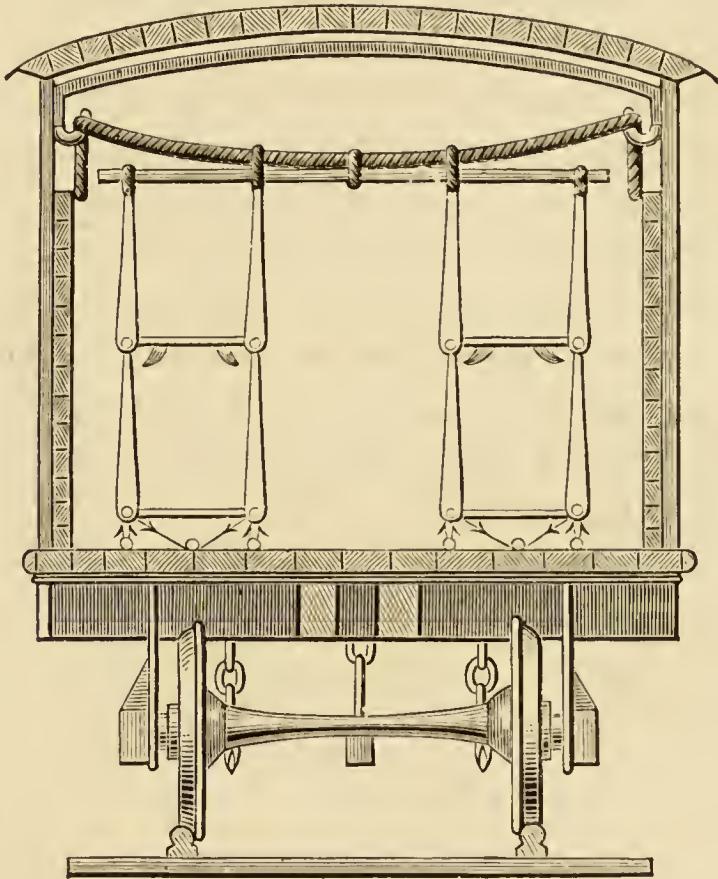


FIG. 47.—Transverse section of a railway goods wagon fitted on Zavodovski's plan for transporting wounded.

The ends of the axletrees are furnished with rings, for the attachment of drag-ropes.

The after axle works on a pivot to a limited extent, to facilitate turning the cart.

Under the axles are slung four folded-up stretchers.

The advantages claimed for this cart are—lightness, nearly every part of it being of skeleton form, strength, easy propulsion, and portability.



The machine can be taken entirely to pieces in about five minutes ; its several parts carried over a stream, or other obstacle, and put together, completely, in about the same space of time. Its jointings are of the simplest kind, and no more complicated tool is required than a spanner.

**Railway Goods Wagons** are converted into sick transport cars by a variety of methods, all involving the use of suspending loops and spring floor rests for the stretchers. The most simple method is that of Zavodovski.

This method consists of fastening a cable (Fig. 47) into hooks screwed into the top of the sides of the wagon. To this cable is fastened, by ropes, a pole, stretching across the upper part of the car ; from the pole hang down four loops of rope, in which rest the stretcher handles in two tiers.

The lower tier of stretchers are fastened by ropes to rings or hooks, screwed into the wagon floor, to lessen swinging from side to side. A large goods van will carry eight patients slung thus on stretchers.



*Bearer's Form of Sick Report for Medical Officer.*

— Marching Column (or — Brigade Mobilisation), or  
 ——— Camp, &c. &c.

RANK.	NAME.	CORPS.	MALADY.	TREATMENT.
Pte.	Smith, A. B.	2nd. V. B. R. Sussex.	Sprained Knee.	Wet Bandage.
Cpl.	Jones, C.	1st. V. B. R. W. Kent.	Sunstroke.	Cold Douche.
Sergt.	Browne, D. E.	3rd. Mx. Art. V.	Burn of Hand.	Oiled Lint.
Bdr.	Robinson, F. G.	1st. Essex Art. V.	Syncope.	Rest in Wagon.
Bglr.	White, H.	1st. Lond. E. V.	Diarrhoea.	D.Mixture and Chlorodyne.
Driver	Green, James.	1st. V. B. R. Warwick.	Fract. Tibia.	Leg Splints.

(Signed) L. M—

{ Ambulance Sergeant }  
 { " Corporal } — Regt.  
 { Regimental Bearer }

(Date.).....

TABLE OF POISONS.

Poison.	Symptoms.	Emetic to be given, &c.	Antidotes, &c.
1. Strong Mineral Acids.	<p>Immediate burning pain in mouth, throat, and stomach, reaching abdomen.</p> <p>Vomiting, purging.</p> <p>Death from shock, suffocation, or exhaustion.</p>	1. Give none.	1. Magnesia, 4 oz. to 1 pint of water; or soap and water; or chalk or whitening, and water to drink.
2. Caustic Alkalis (Ammonia, Potash, &c.)		2. Do.	2. Lemon juice or vinegar to drink.
3. Oxalic Acid.		3. Do.	3. Magnesia, chalk, or whitening and water.
4. Corrosive Sublimate.		4. Do.	4. Raw eggs beaten up; flour and water; milk.
5. Chloride of Zinc.		5. Do.	5. Bicarbonate soda and water, followed by raw eggs.
6. Chloride of Antimony.		6. Do.	6. Tea, coffee, tannic acid and water.
7. Arsenic.		7. Zinc sulphate and water.	7. Tincture of steel and bicarbonate soda and water; raw eggs and milk; oil and lime water.
8. Tin.	<p>Symptoms may not appear all at once, and vary very much.</p> <p>After a time, pain and dryness of throat, great sickness, vomiting, loss of voice, cold sweats.</p> <p>Death from shock and exhaustion.</p>	8. Do.	8. Carbonate ammonia and water.
9. Lead.		9. Do.	9. Epsom salts and water.
10. Copper.		10. Do.	10. Raw eggs and milk.
11. Phosphorus.		11. Do.	11. Magnesia or chalk mixed in milk or gruel.
12. Iodine.		12. Do.	12. Starch and water gruel.
13. Spanish Fly.		13. Do.	13. Linseed tea gruel.

TABLE OF POISONS—*continued*.

Poison.	Symptoms.	Emetic to be given, &c.	Antidotes, &c.
14. Irritant Gases.	Headache and drowsiness.	14. None required.	14. Fresh air, water dashed on head and chest, artificial respiration.
15. Opium (Laudanum, Morphia).	Giddiness, headache, dimness of sight, contracted eye-pupils, drowsiness and stupor.	15. Mustard and water.	15. Keep patient awake; hot coffee.
16. Belladonna.	Thirst, much enlarged eye-pupils, mental wandering, delirium.	16. Zinc sulphate.	16. Charcoal powder and water; strong coffee.
17. Henbane.		17. Do.	17. Do.
18. Strychnine.	Convulsions with violence, lock-jaw, but mind quite clear.	18. Stomach pump required.	18. Plenty of olive oil to drink.
19. Prussic Acid.	Death by shock, and poison so quick in action as not to allow of symptoms usually.	19. If possible, give strong emetic of zinc sulphate.	19. Restore animation by dashing cold water over head and chest; smelling salts to nose; give brandy and water.
20. Carbolic Acid.	Intense burning pain from mouth to stomach, giddiness, breath smells of carbolic.	20. Mustard or zinc sulphate and water.	20. Magnesia mixed with olive oil; raw eggs and milk.
21. Aconite.	Numbness, tingling, burning and tightness felt in the throat.	21. Zinc sulphate.	21. Give brandy and water; rub limbs and spine with hot towels.
22. Lunar Caustic (Nitrate of Silver).	Immediate vomiting usually.	22. None required.	22. Common salt and water, or sea water to drink in plenty.





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